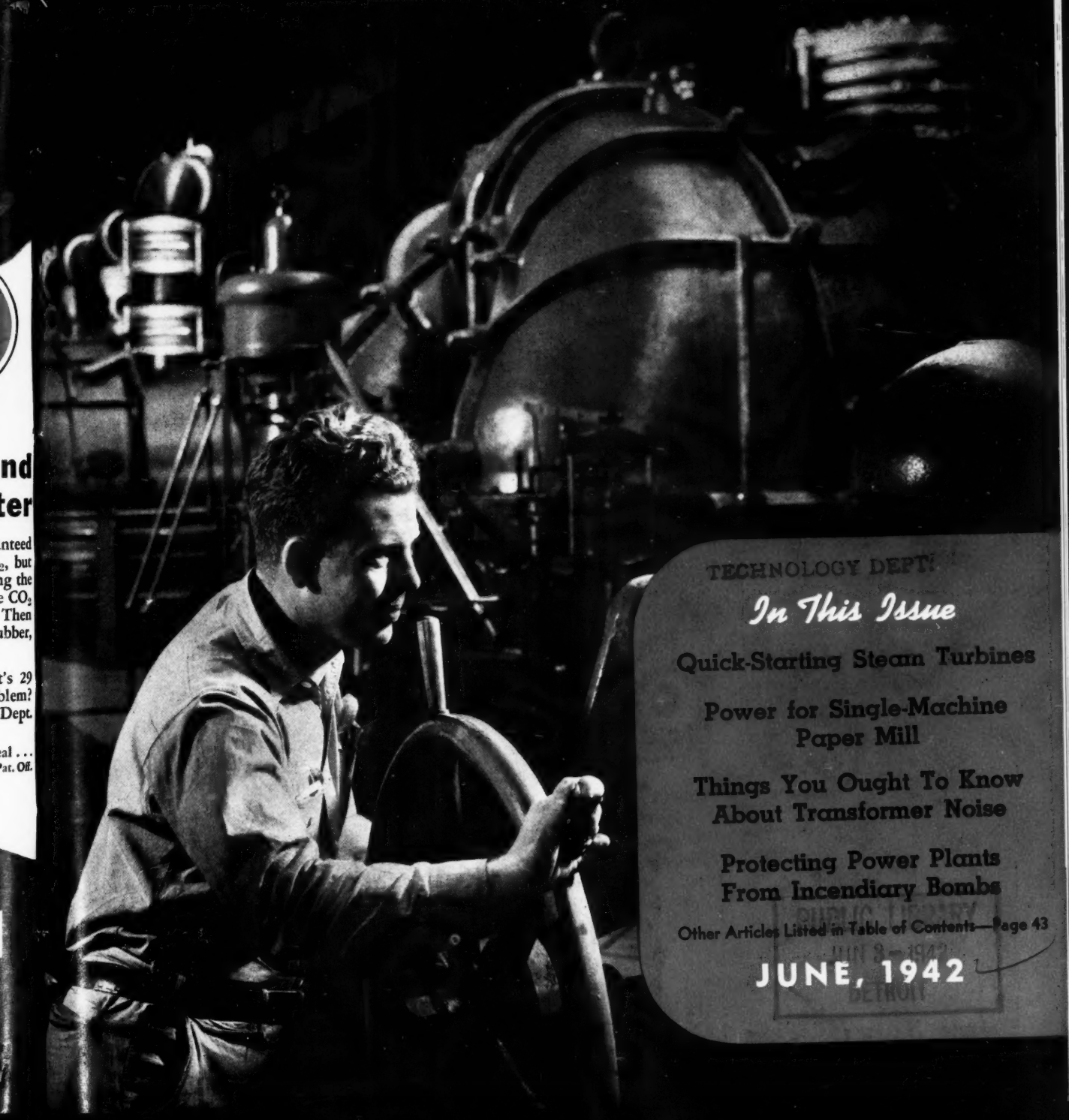
POWER PLANT ENGINEERING

THE PLANT ENGINEERING AND MAINTENANCE MAGAZINE FOR EVERY INDUSTRY



TECHNOLOGY DEPT.

In This Issue

Quick-Starting Steam Turbines

Power for Single-Machine Paper Mill

Things You Ought To Know About Transformer Noise

Protecting Power Plants From Incendiary Bombs

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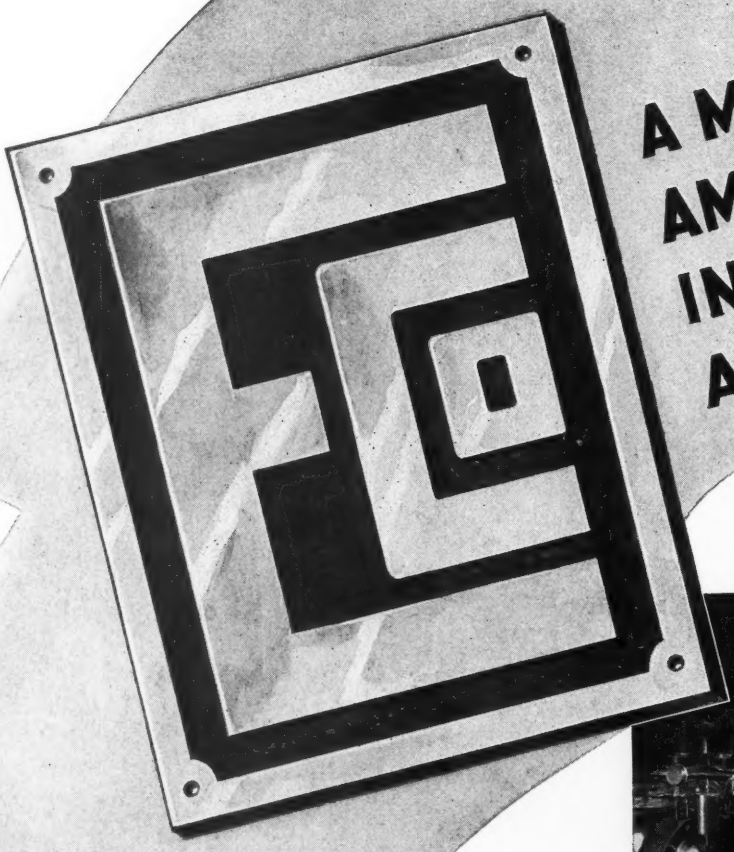
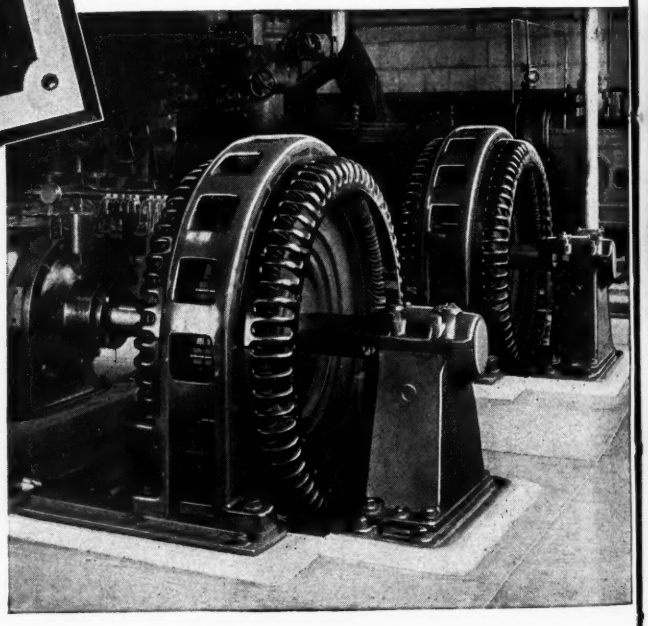
DETROIT

JUNE, 1942

One symbol like this is worth a



A MARK OF AMERICAN INDUSTRY AT ITS BEST



Two Elliott engine-type synchronous motors equipped with double diamond-cage winding, driving compressors. They are doing an excellent job and their operation is exceptionally quiet.

L-734

ELLIOTT COMPANY

Electric Power Dept.

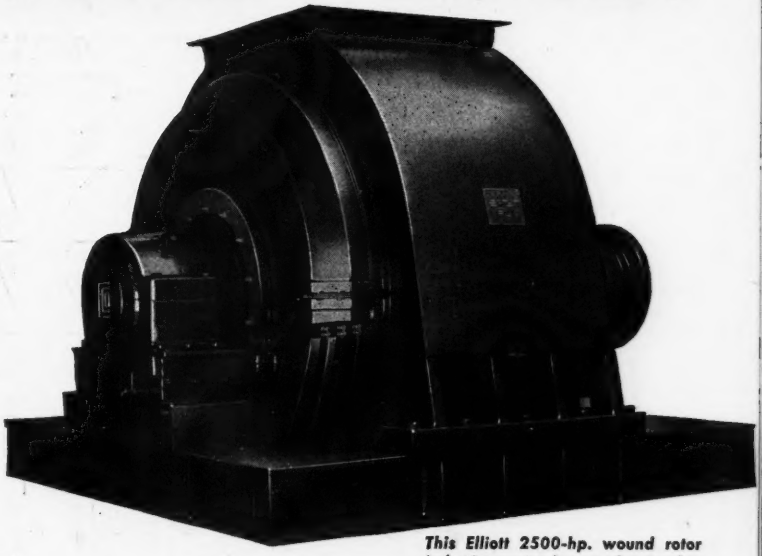
RIDGWAY, PA.

DISTRICT OFFICES IN PRINCIPAL CITIES

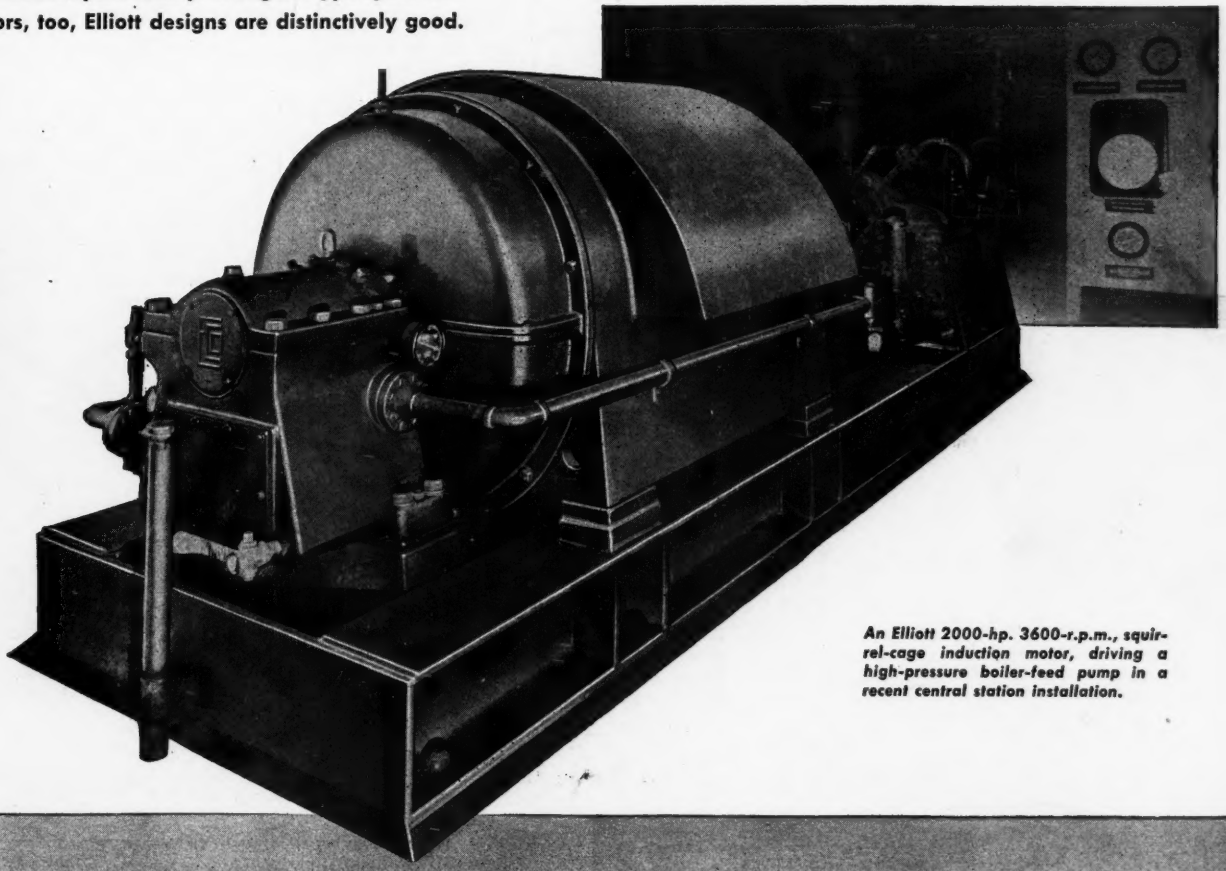
...a million SWASTIKAS!

They started it, this war of identifying marks and monograms. But our enemies' rising suns and swastikas have now run head-on into the might of American Industry, as typified by the Elliott symbol and countless others which in their total represent invincible skill and productive capacity. Power will win the war — the power behind the trade-marks of America.

TAKE MOTORS, FOR INSTANCE — the Elliott mark is found on the bearing caps of thousands of capable, quiet driving units whose every revolution adds to anti-Axis force. For rugged, dependable Elliott motors are particularly fitted and widely applied where conditions are unusual or the driving job especially difficult. Important public utility and industrial plants come to Elliott Company for large two-pole high-speed motors for such service as driving high-pressure boiler-feed pumps. Elliott engineers have done outstanding work in this field particularly. In engine-type synchronous motors, too, Elliott designs are distinctively good.



This Elliott 2500-hp. wound rotor induction motor is one of a number of similar motors in service, driving dredge pumps, a notoriously difficult job.



An Elliott 2000-hp. 3600-r.p.m., squirrel-cage induction motor, driving a high-pressure boiler-feed pump in a recent central station installation.

TURBINE-GENERATORS • MECHANICAL DRIVE TURBINES • ENGINES • ENGINE-GENERATORS

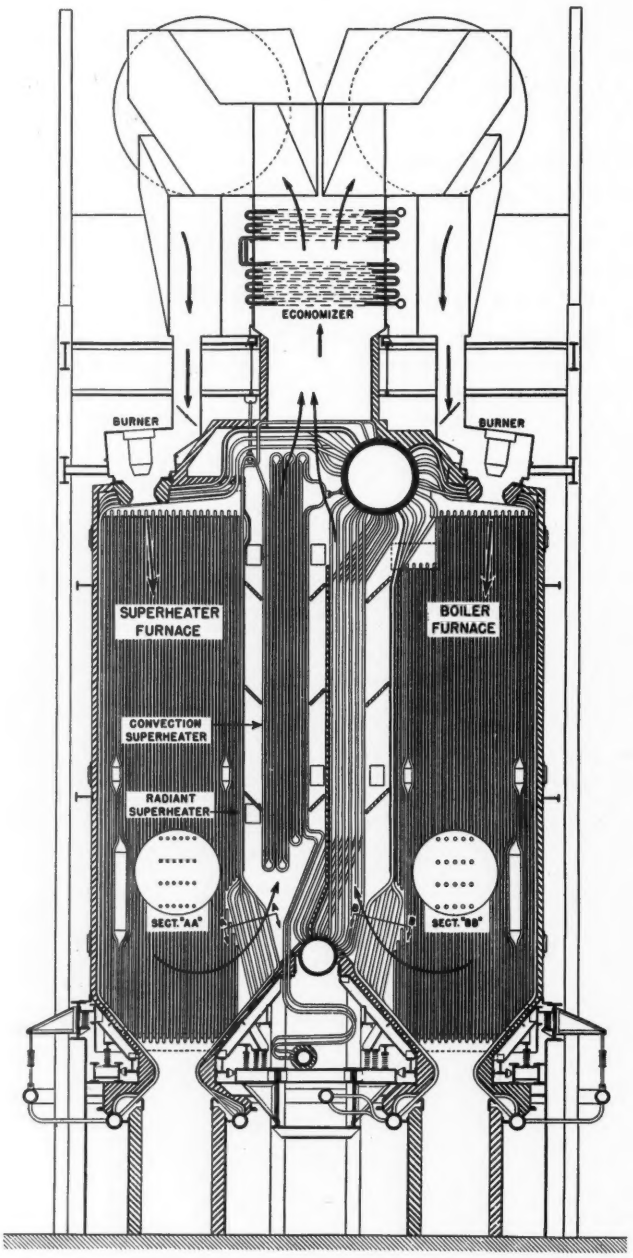
MOTOR-GENERATORS • MOTORS • GENERATORS • CONDENSERS • STEAM JET EJECTORS • DEAERATORS

FEEDWATER HEATERS • DEAERATING HEATERS • CENTRIFUGAL BLOWERS • TURBOCHARGERS • DESUPERHEATERS

STRAINERS • SEPARATORS • GREASE EXTRACTORS • NON-RETURN VALVES • LAGONDA-LIBERTY TUBE CLEANERS

TWIN FURNACES FOR

DUQUESNE LIGHT COMPANY —FRANK R. PHILLIPS STATION



FW FOSTER

CENTRAL STATIONS

The twin furnace steam generator was designed to provide satisfactory adaptations of four essential characteristics for central station service.

1. **SLAG FREE OPERATION**

Furnace gases reduced below slagging temerature before entering boiler or superheater heating surfaces by: (1) increasing waterwall surface 25 to 40% (2) separately fired superheater furnace which gives absolute control of final steam temperature.

2. **WIDE RANGE OF SUPERHEAT CONTROL**

Radiant and convection superheaters have complementary characteristics which in themselves provide constant steam temperatures over wide load range. Range of superheat control can be further increased by differential firing of boiler and superheater furnaces.

3. **MAINTENANCE OF SAFE METAL TEMPERATURES IN SUPERHEATER**

Overheating of superheater is avoided by firing the boiler furnace only when starting up.

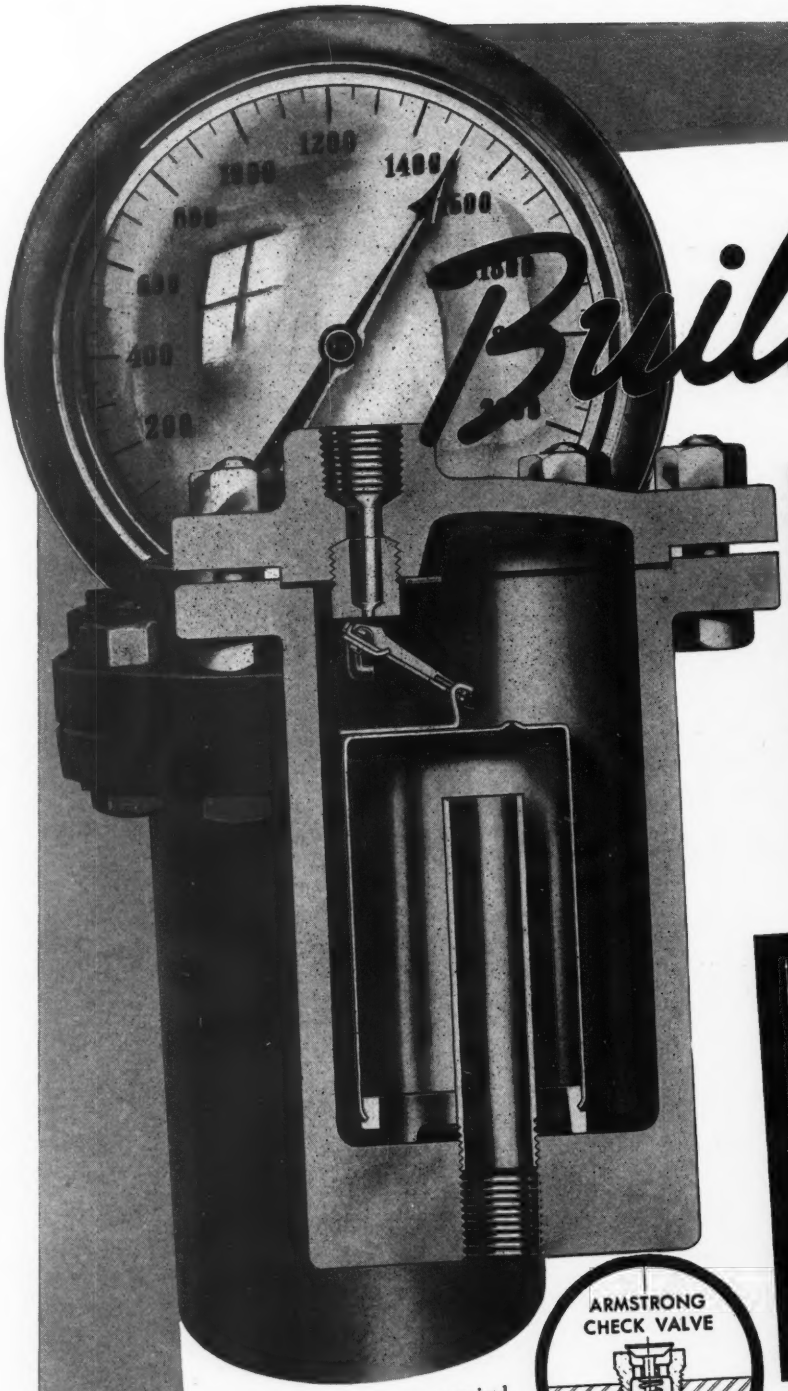
4. **HIGH AVAILABILITY**

Slag free operation and elimination of superheater overheating afford high availability and dependable performance.

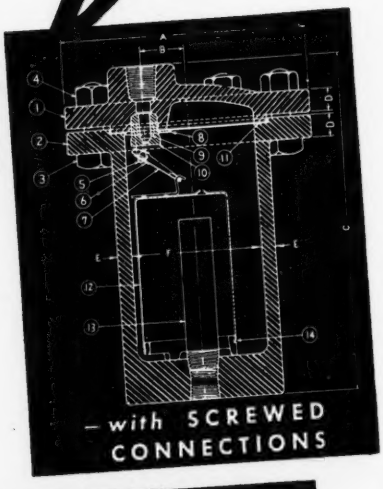
FOSTER WHEELER CORPORATION, 165 BROADWAY, NEW YORK, N. Y.

WHEELER

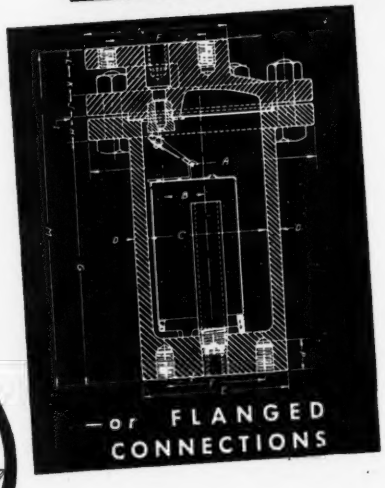
Published monthly by the Technical Publishing Co., at 53 West Jackson Blvd., Chicago, Ill., U. S. A. Subscription price, $2.00 a year. Single copies current issue, 25c. Entered as second class matter September 3, 1932, at the Post Office, Chicago, Ill., under act of March 3, 1879. Vol. XLVI, No. 6.



Built for



—with SCREWED CONNECTIONS



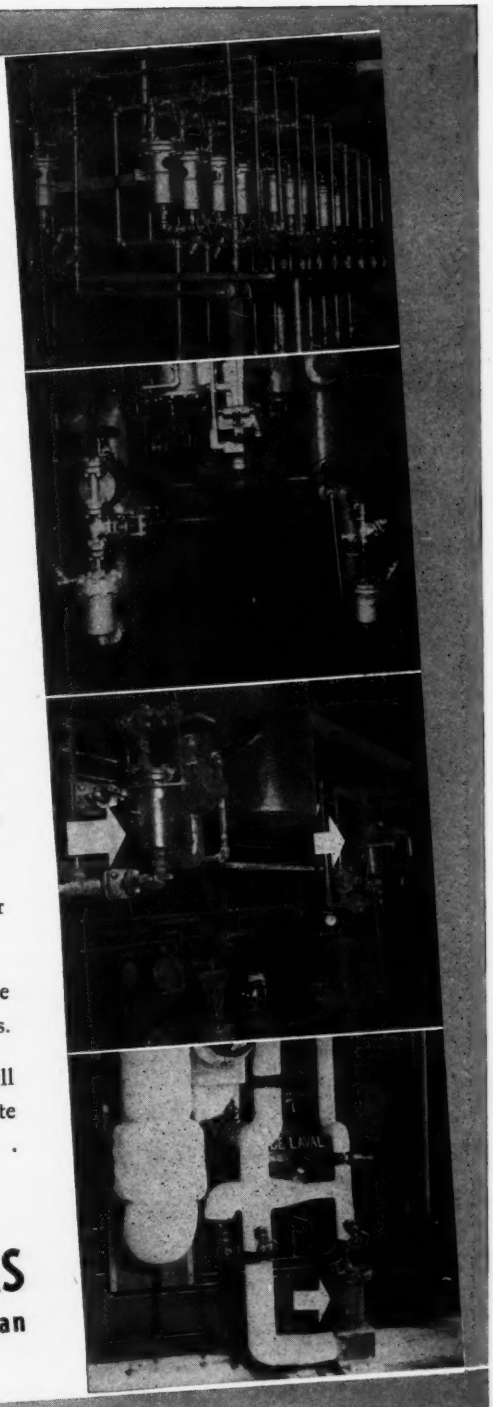
—or FLANGED CONNECTIONS

● Where check valves are required, specify ARMSTRONG INTERNAL TYPE CHECK VALVES—no external joints, quality construction, low cost!

ARMSTRONG · INVERTED BUCKET · STEAM TRAP

ARMSTRONG Forged Steel

HIGH TEMPERATURE HIGH PRESSURE SERVICE



ARMSTRONG pioneered the use of *special die forgings* for cap and body of high pressure steam traps, and Armstrong design has kept apace with the increased steam pressures used in modern central stations and industrial power plants.

ECONOMICAL TO USE! Wide choice of sizes starting with small 1/2 inch size. Built for either screwed or flanged connections.

FOR ANY PRESSURE! Built for 400, 600, 900, 1500 and 2400 lbs. steam pressure.

FOR ANY CAPACITY! Forged steel construction available for both plain traps and super-capacity compound traps.

UNSURPASSED QUALITY! Cap and body 79,000 lb. tensile strength, or higher. All-stainless steel trim. Heat treated valves.

COMPLETE ENGINEERING DATA. Printed information will be sent to you on request and without obligation. Complete capacity curves . . . trap specification and dimension sheets . . . installation diagrams.

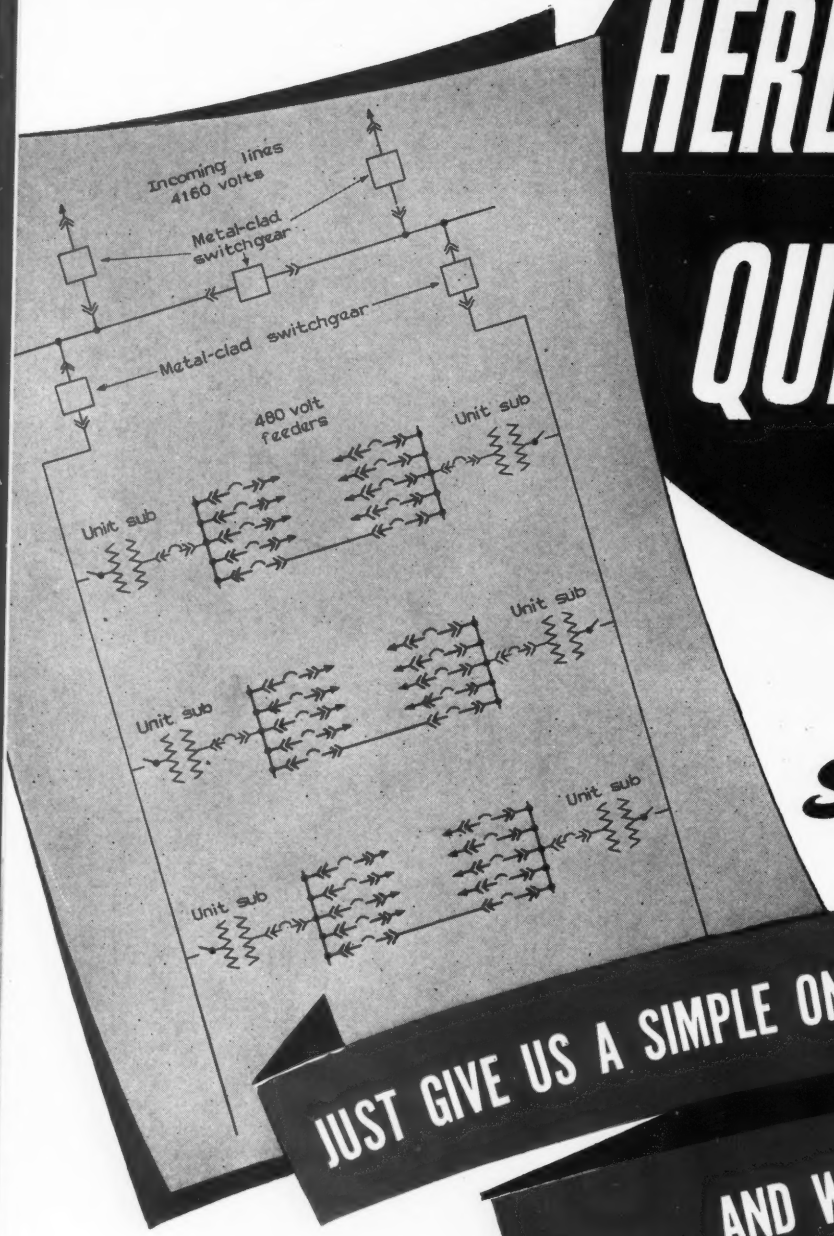
ARMSTRONG MACHINE WORKS

810 Maple Street **Three Rivers, Michigan**

STEAM TRAPS

Saving Fuel, Metals and Manpower for the Battle of Production

HERE'S A NEW QUICK WAY



TO GET SWITCHGEAR

JUST GIVE US A SIMPLE ONE-LINE DIAGRAM

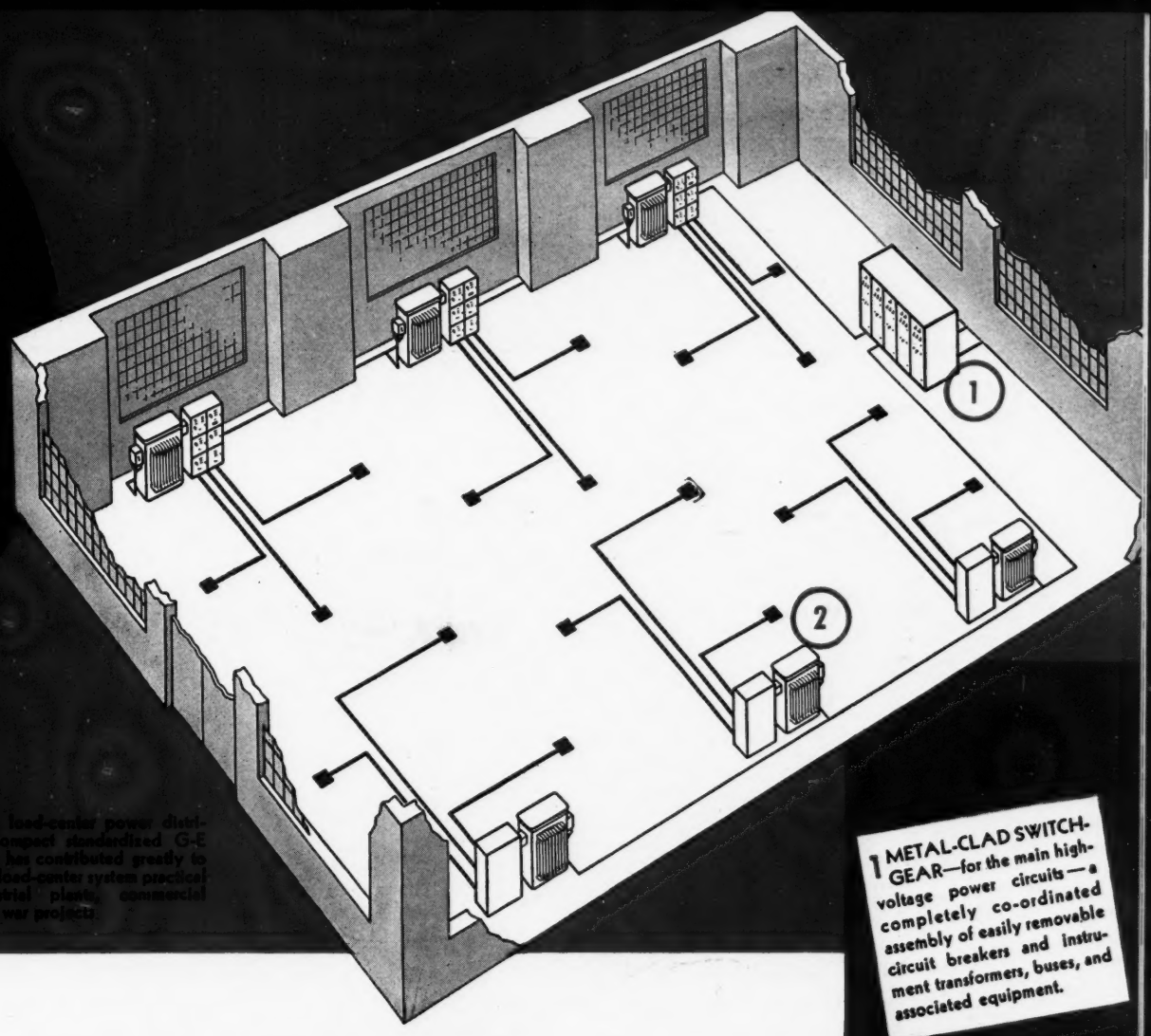
. . . . . AND WE'LL GO TO WORK ON

STANDARD SWITCHGEAR equipments mean *more* and *better* switchgear for scores of plant engineers charged with equipping new and enlarged plants for wartime production.

More — because our own war-geared factories are tooled to make standard switchgear in ever-increasing volume. This means you'll get standard switchgear sooner.

Better — because we've worked for years to standardize the best equipments. We established a "one best" standard in every line—designed it for superior service over a wide range of applications. In recent years, industry ordered thousands of these "packaged" units to gain added safety, operating dependability and economy. Now the speedy production of switchgear, as well as quick installation, is so vital that standard switchgear is an ***absolute necessity***. And we're ready, with standard equipments already developed and proved.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.



Illustrating load-center power distribution. Compact standardized G-E switchgear has contributed greatly to make the load-center system practical for industrial plants, commercial buildings, war projects.

1 METAL-CLAD SWITCHGEAR—for the main high-voltage power circuits—a completely co-ordinated assembly of easily removable circuit breakers and instrument transformers, buses, and associated equipment.

Standard EQUIPMENTS

2 LOAD-CENTER UNIT SUBSTATIONS—for distribution, control, and protection of low-voltage power up to 600 volts—a completely co-ordinated assembly of drawout-air-breaker switchgear equipments, transformers, and high-voltage protective devices.

Get Any or All of Your Plant Switchgear Equipments This Easy Better Way

NOW you can save precious days and weeks formerly spent over the drawing board and in drawn-out correspondence. Now you need only give us a simple one-line diagram showing the switchgear functions to be performed and the ratings.

You'll get our standard switchgear—the best, and the safest, we know how to build.

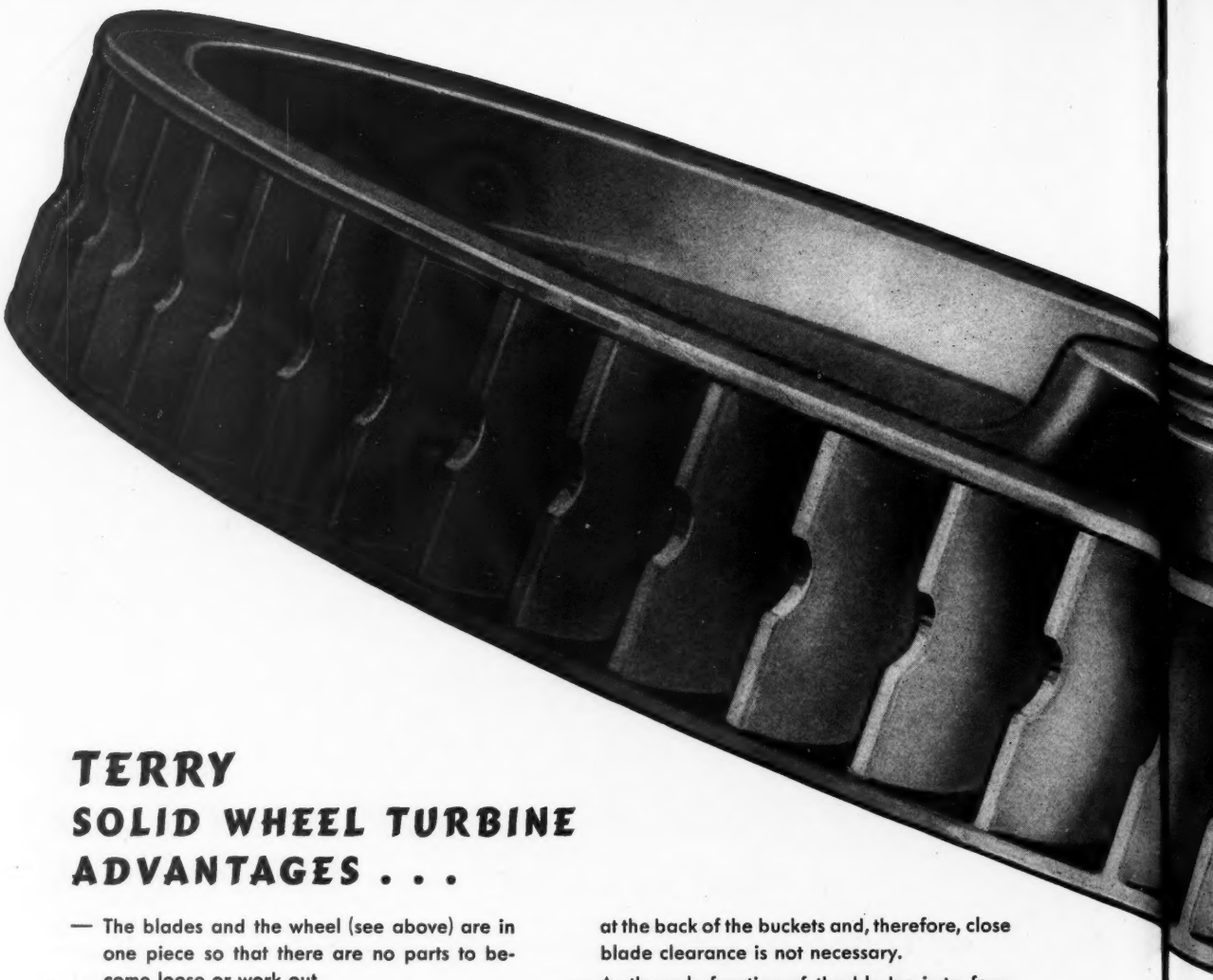
You can get everything you need in plant switchgear this quick, simple way. Every one of our standard equipments is designed for the broadest possible application. Our line of standard equipments is complete. Ask your nearest G-E office for additional information, or write the General Electric Company, Schenectady, N. Y.

EVERYTHING IN STATION SWITCHGEAR, TOO—Complete switchgear for the power station is described in our new bulletin, GEA-3742 — everything from large FH cubicles right down to the metal-enclosed bus runs.

GENERAL ELECTRIC

854-16-7300

The TERRY



TERRY
SOLID WHEEL TURBINE
ADVANTAGES . . .

— The blades and the wheel (see above) are in one piece so that there are no parts to become loose or work out.

— The blades have large clearances.

— The blades are double rim protected.

— End play will not damage the blading.

— It is impossible for the blades to foul.

— The power producing action of the steam in the wheel takes place on the curved surfaces at the back of the buckets and, therefore, close blade clearance is not necessary.

— As the only function of the blades is to form a series of pockets, wear of the blade edges is of little consequence and does not materially affect the horsepower or efficiency. The important part of the bucket is the back, or bottom, which is a solid forging.

— The Terry wheel will withstand abuse that would wreck any built up wheel.

THE TERRY STEAM TURBINE CO.

Wheel Turbine

The Terry Solid Wheel Turbine is available in ratings from 5 HP to 2000 HP. It is built for all commercial steam pressures and exhaust pressures. Thousands of them are in daily service in central stations, industrial plants and on board naval vessels.

Full details of the Terry Solid Wheel Turbine will be gladly sent upon request. Ask for Bulletin S-116.

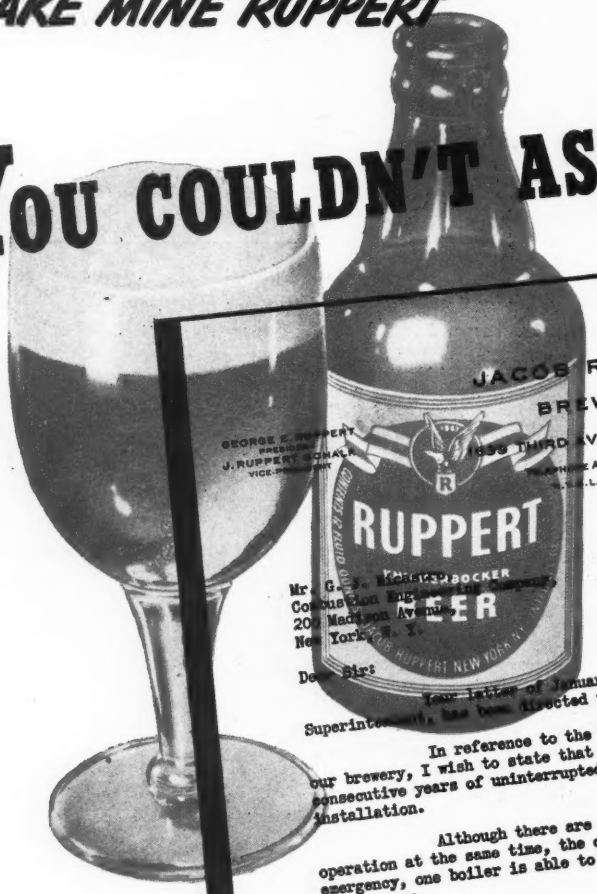
At right—
Action of steam in Terry wheel turbine. The steam issues from an expanding nozzle at high velocity and enters the side of the wheel bucket in which its direction is reversed 180°. As this single reversal uses but a portion of the available energy, the steam is caught in a stationary reversing chamber and returned again to the wheel. This process is repeated several times until practically all of the useful energy has been utilized

T-1147

TERRY SQUARE - HARTFORD, CONN.

"MAKE MINE RUPPERT"

YOU COULDN'T ASK FOR BETTER



JACOB RUPPERT
BREWERY
1639 THIRD AVENUE, NEW YORK
TELEPHONE ATWATER 9-1000
U.S.B.L.A. LIC. NO D-1

GEORGE E. RUPPERT, PRESIDENT
J. RUPPERT SCHMALZ, VICE-PRESIDENT
H. GARRISON SILLECK, 3RD, SECRETARY
FREDERICK M. LINDER, TREASURER

February 6, 1942.

Mr. G. J. Richardson, Engineer,
Combustion Engineering Company,
200 Madison Avenue,
New York, N. Y.

Dear Sir:

Your letter of January 27th, addressed to Mr. Schuler, Plant Superintendent, has been directed to my attention.

In reference to the three VU type steam generators installed at our brewery, I wish to state that these generators have given us three consecutive years of uninterrupted and highly satisfactory service since their installation.

Although there are three boilers installed, only two are in operation at the same time, the other one being held as a spare. In case of emergency, one boiler is able to take the normal maximum load for a period of three hours.

With reference to efficiency, we wish to say that while generating steam at 410 lbs. Pressure, 650° Fahrenheit, with the load varying from 30,000 lbs. per hour to 65,000 lbs., we have averaged 12.5 lbs. of steam evaporated per pound of coal, or 125 lbs. of steam evaporated per gallon of oil. The above figures are taken from a monthly average. This comparatively new boiler installation is much more efficient that the former boiler plant when it is considered that 8½ lbs. of water evaporated per pound of coal was good performance in the old plant.

In addition to greater efficiency and reliability, the new boiler installation offers great flexibility. Either pulverized coal, or oil, can be burned depending on the economics involved, and the boiler can be switched from one fuel to the other in less than one minute.

In closing, I wish to say that I am, personally, highly satisfied with the performance of these boilers and all their incidental equipment.

Yours very truly,

George E. Ruppert

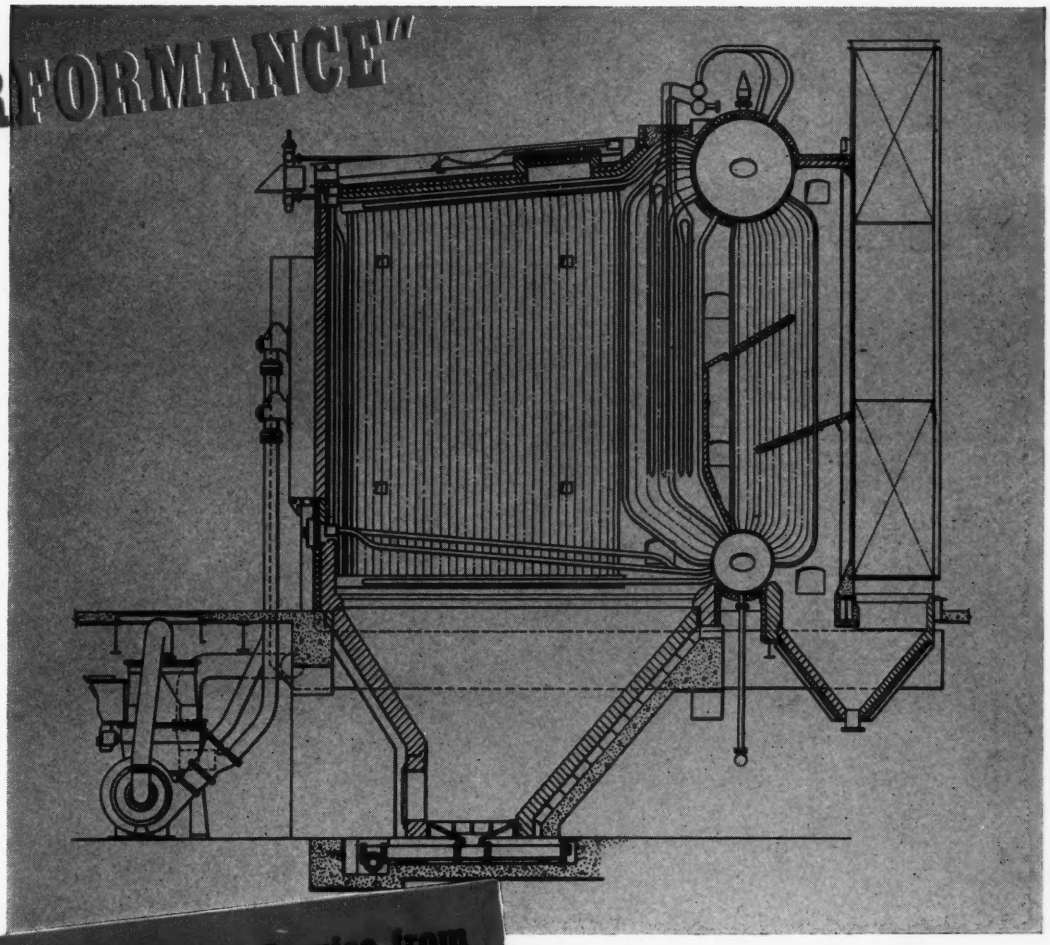
George E. Ruppert, President.

GER:H

C-E PRODUCTS INCLUDE ALL TYPES OF BOILERS, FURNACES; PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS, AND AIR HEATERS

COMBUSTION

"PERFORMANCE"



A report of 3 years' Service from 3 VU STEAM GENERATORS AT JACOB RUPPERT BREWERY

Typical of the performance of VU Steam Generators throughout industry, is this record of efficiency, reliability and low-cost operation turned in by three VU Units which have just completed three years of service in the modern power plant of the Jacob Ruppert Brewery.

Continuous Service

In the words of President George E. Ruppert (letter on left page), the three VU Units have provided "three consecutive years of uninterrupted and highly satisfactory service."

Economical Operation

Monthly average evaporation of 12½ lb of steam per lb of coal is 50% more than the best performance obtained from the previous boilers.

Speedy Fuel Change-Over

The VU Units, which are designed to burn either pulverized coal or oil, can be switched from one fuel to the other in less than one minute.

Low Bowl Mill Maintenance

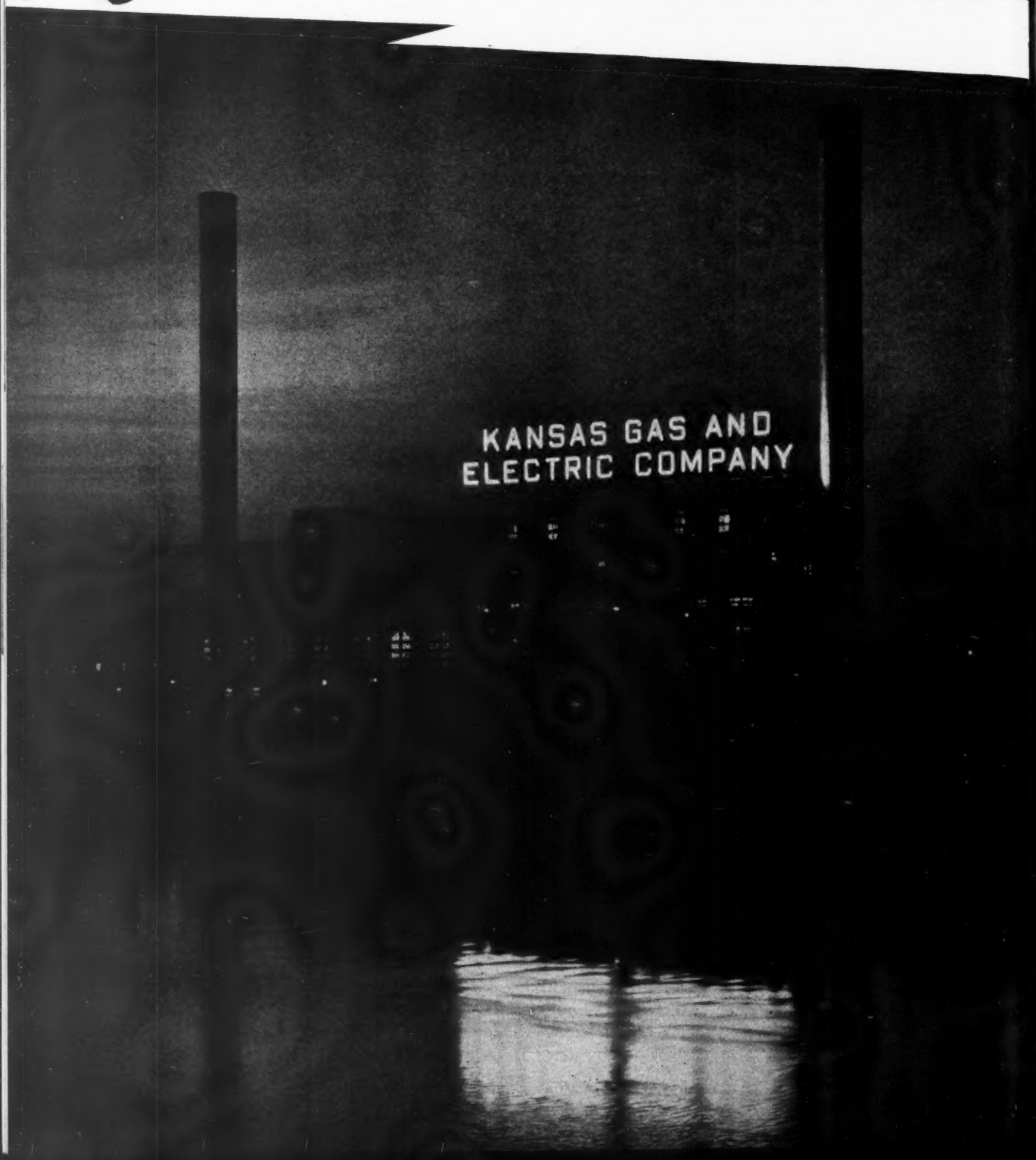
The pulverizer equipment, which consists of three C-E Raymond Bowl Mills, has provided three years of typically satisfactory service marked by quietness of operation and negligible maintenance.

A-655

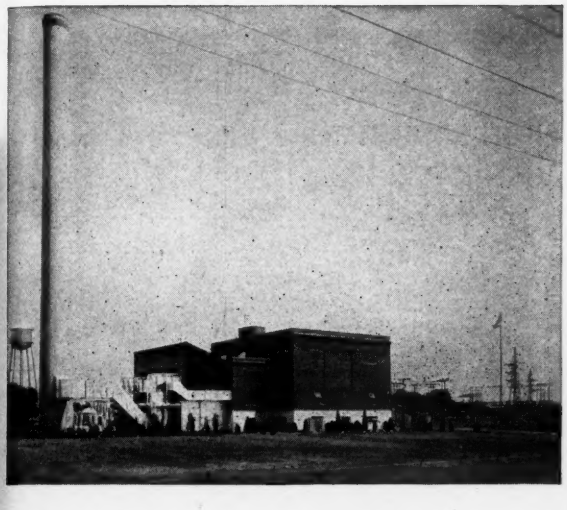
COMBUSTION ENGINEERING COMPANY, INC., 200 MADISON AVENUE, NEW YORK, N. Y. • CANADA: COMBUSTION ENGINEERING CORPORATION, LTD., MONTREAL

ENGINEERING

KILOWATTS

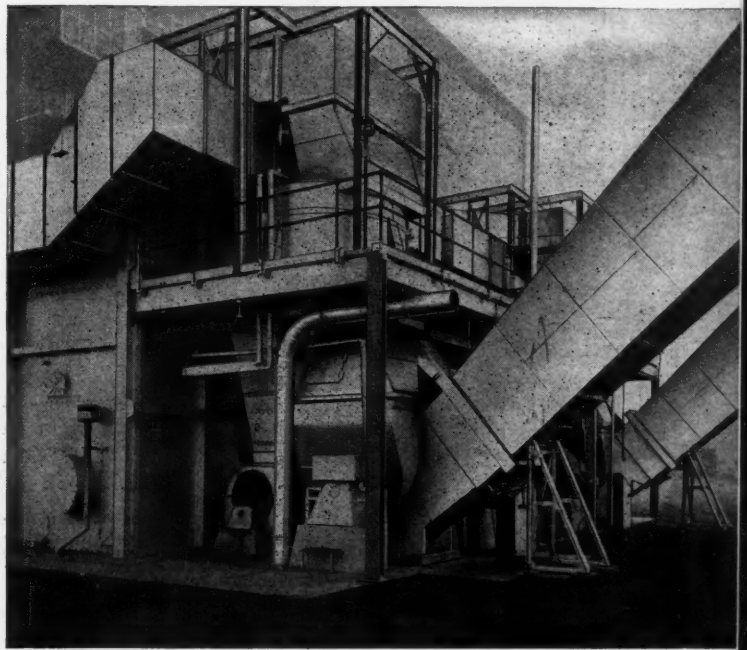


FOR KANSAS



AERIAL VIEW of downtown Wichita, one of 98 municipalities served by the Kansas Gas and Electric Company. Among these are Newton, El Dorado, Pittsburg, Independence and Arkansas City. Such varied and vital products as wheat, flour, petroleum, coal, meat, cement, gas, carbide, and all-important aircraft are produced in the area served by the company.

Building Kansas with kilowatts — serving more and yet more homes, farms, commercial and industrial establishments with dependable, economical, abundant electric power—that's the job the Kansas Gas and Electric Company cut out for itself more than a quarter-century ago. The company's expansion and improvement programs have never stopped. Today, more than 253,000 persons, living in a territory of some 6,000 square miles in South Central and Southeastern Kansas, depend on the vital services of the Kansas Gas and Electric Company. In addition to the Wichita plant (at left) and new Ripley station (above), the company also has the large Neosho station at Parsons, Kansas. Installed electrical generating capacity of the great interconnected system now totals 89,000 kw. It gives us great satisfaction to have American Blower Forced and Induced Draft Fans operating as a part of these modern facilities. May we have the opportunity of discussing the advantages of American Blower Mechanical Draft equipment and Fluid Drives with you?

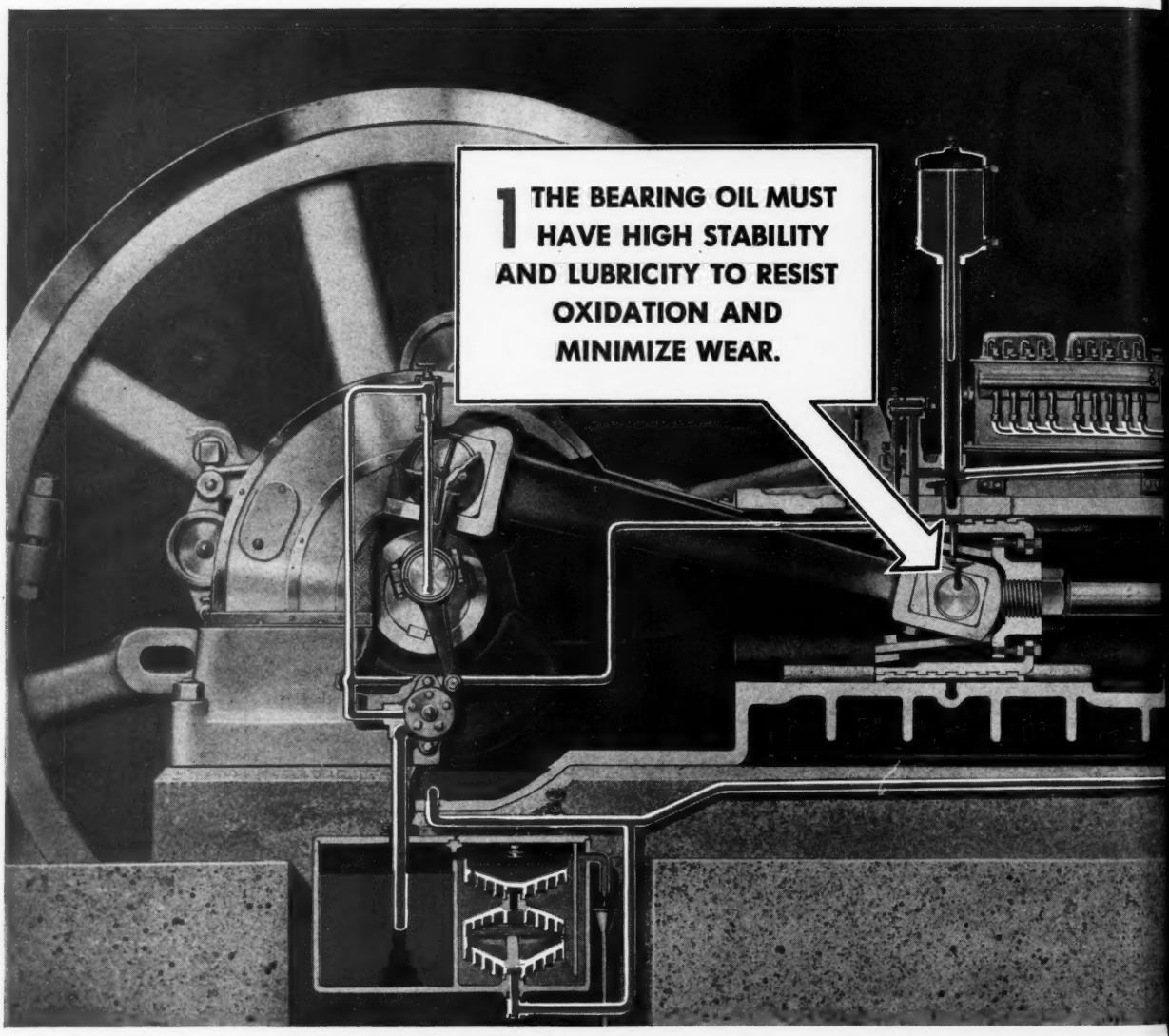


IN THE Kansas Gas and Electric Company's newest plant, the Ripley steam electric station, you'll find the dependable American Blower Forced and Induced Draft Fans shown above. Write our nearest branch for data.

AMERICAN BLOWER

AMERICAN BLOWER CORPORATION, DETROIT, MICH.
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO
Division of American Radiator and Standard Sanitary Corporation

Fighting a "2-Front" War



A "CORRECT" ANSWER TO CYLINDER AND BEARING LUBRICATION NEEDS OF RECIPROCATING STEAM ENGINES:

Problem: An engineer is faced with a double lubrication problem in preventing "trouble" in steam engine operation:

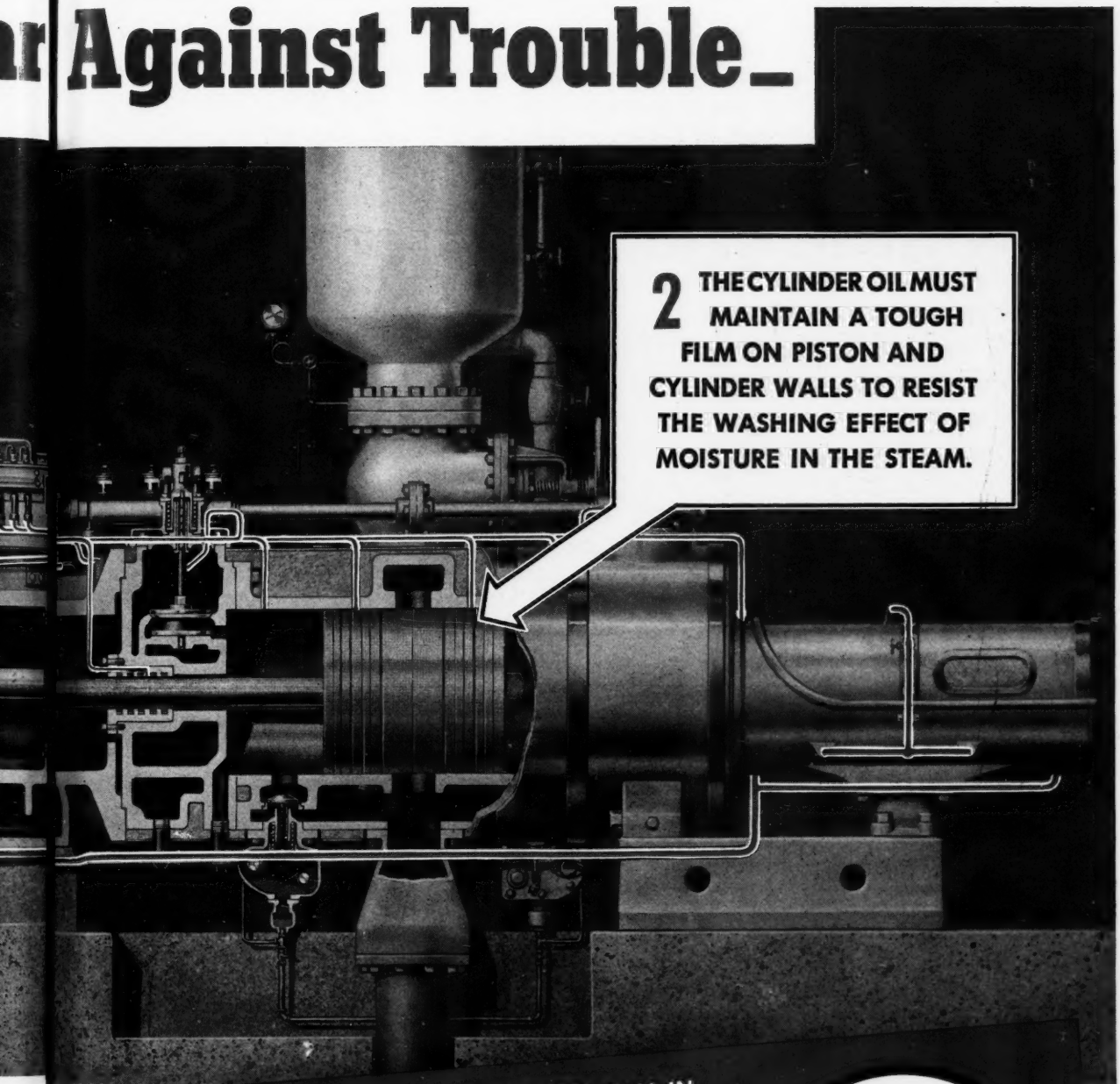
1. *In the bearings,* oil is supplied by a circulation system. That oil must have high stability and lubricity to resist oxidation and minimize wear.

2. *In the cylinder,* oil must be fed in restricted feeds to minimize the amount carried to the boiler feed water. The oil must maintain a tough film on the piston and cylinder walls. That film must resist the washing effect of moisture in the steam.

Answer: For correct cylinder lubrication, *Gargoyle Cylinder Oils* are unsurpassed in their combination of film strength and special adhesive properties in the presence of water.

For bearing lubrication, *Gargoyle D. T. E. Oils* have the high stability and lubrication properties needed to assure long, trouble-free bearing life.

Against Trouble—


2 THE CYLINDER OIL MUST MAINTAIN A TOUGH FILM ON PISTON AND CYLINDER WALLS TO RESIST THE WASHING EFFECT OF MOISTURE IN THE STEAM.

TO HELP MAINTAIN WARTIME PRODUCTION, CALL IN

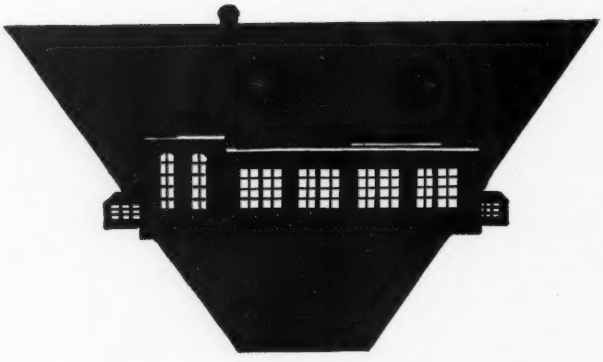
SOCONY-VACUUM for "Correct Lubrication"

GARGOYLE Lubricants

SOCONY-VACUUM OIL CO., INC. — Standard Oil of N. Y. Div. — White Star Div. Lubrite Div. — Chicago Div. — White Eagle Div. — Wadhams Div. — Southeastern Div. (Baltimore) — Magnolia Petroleum Company — General Petroleum Corporation of Calif.

Over 100 Babcock & Wilcox Integral-Furnace Boilers Classes 9, 12, & 15

HAVE BEEN PURCHASED

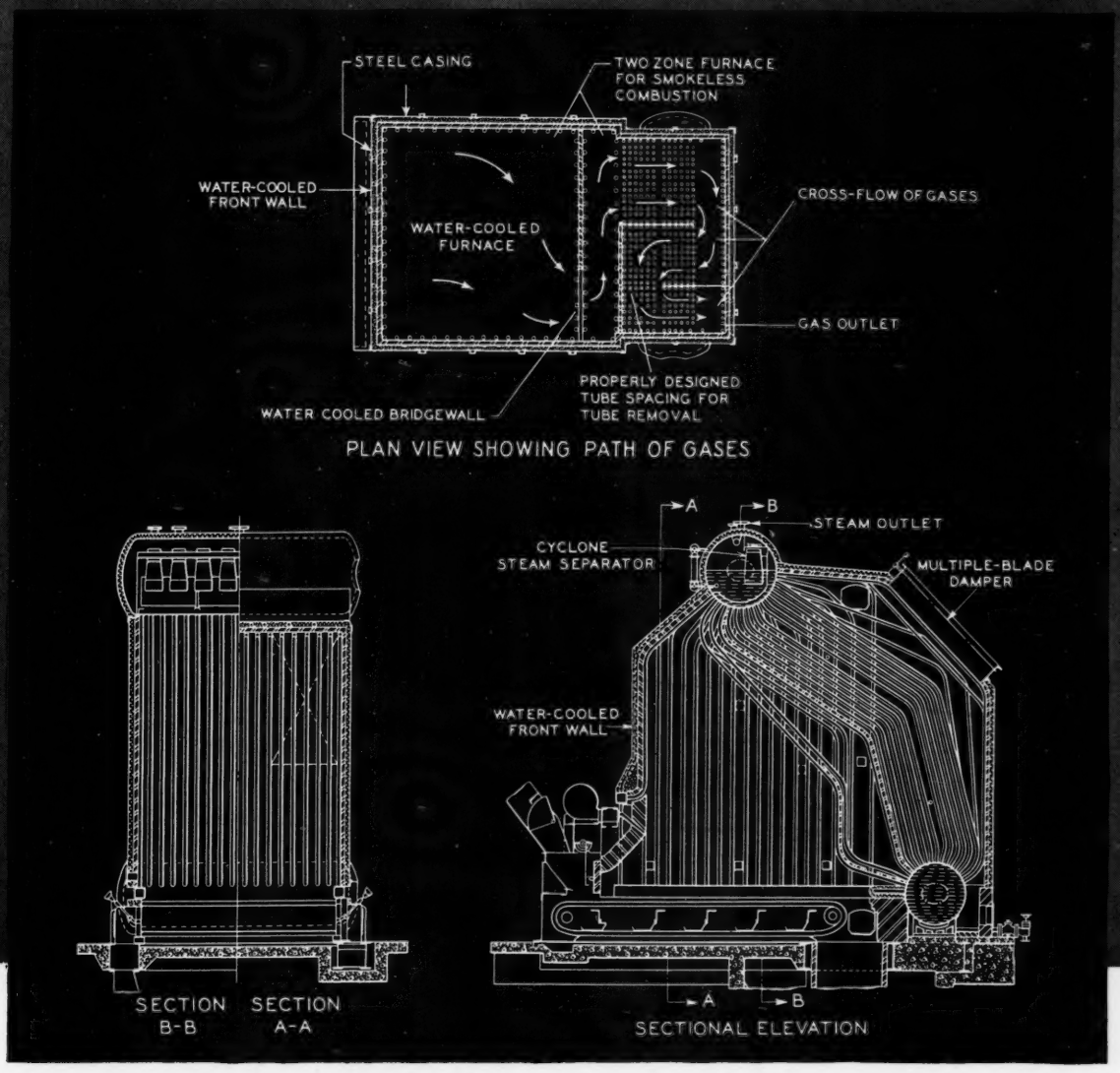


Many of the principles that have made Babcock & Wilcox Boilers the choice of so many central stations are equally effective in the smaller industrial plants in Integral-Furnace Boilers, Classes 9, 12, and 15. The fuel savings, dependability, and lessened maintenance made possible by these boilers in industrial service constitute major advantages.

● *Wide range in fuel selection.* The large amount of water-cooled surface in the furnace permits wide variation in the grades of coal that can be burned successfully. Oil-fired boilers can be readily converted to stoker firing at small cost for brick-work changes.

● *Efficient heat absorption* results from the cross flow of gases over an arrangement of heating surfaces that has demonstrated its merit in hundreds of boilers now in service. The furnace design permits operation with low excess air (high CO_2), resulting in further increase in efficiency.

● *Reduced maintenance* due to completely water-cooled furnace. The furnace contains a minimum of unprotected brickwork. Even the upper front wall and roof are water cooled, as well as the bridge wall and side walls.



● *Circulation*, always a factor in holding down boiler maintenance, is increased by the delivery of steam-free water to the downcomers by the use of B&W Cyclone Steam Separators.

● *Effective soot blowing*. The arrangement of the boiler tubes, with straight lanes between the rows, permits effective cleaning of the entire boiler by two soot-blower elements.

● *Tube removal* is simplified by proper design of tube spacing.

● *Superheaters* can be readily installed at minimum expense, even in boilers originally supplied to produce dry saturated steam only.

THE

BABCOCK & WILCOX COMPANY

•

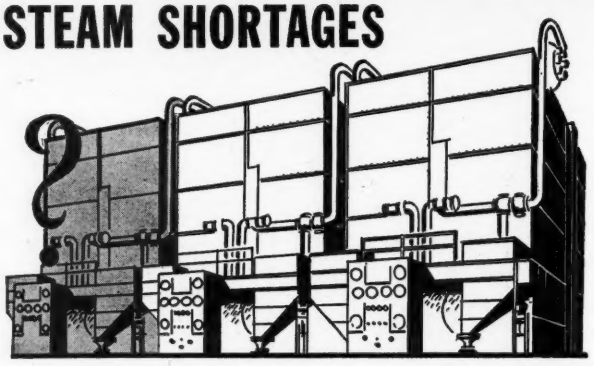
85 LIBERTY ST., NEW YORK, N. Y.

G-226.T

Shortages... and h

Shortages are *not* unavoidable . . . start remedying some of the causes!

STEAM SHORTAGES



Lack of boiler capacity is not the only cause. Poor combustion can reduce steam output as much as 5%. Hagan Automatic Combustion Control increases efficiency, helps you get those vital *extra* pounds you may think are unobtainable.

TIME

You can get new boilers in a year or more—*maybe*. Hagan Control can be installed in a few months—all that is needed in many plants to get over peak production hurdles.

EQUIPMENT

By improving combustion efficiency, Hagan Control not only lowers stoker and furnace maintenance, but reduces boiler outages as a result.

MONEY

Steam production costs are rising and may go higher. You can depend upon Hagan Control to help you keep them at a minimum.

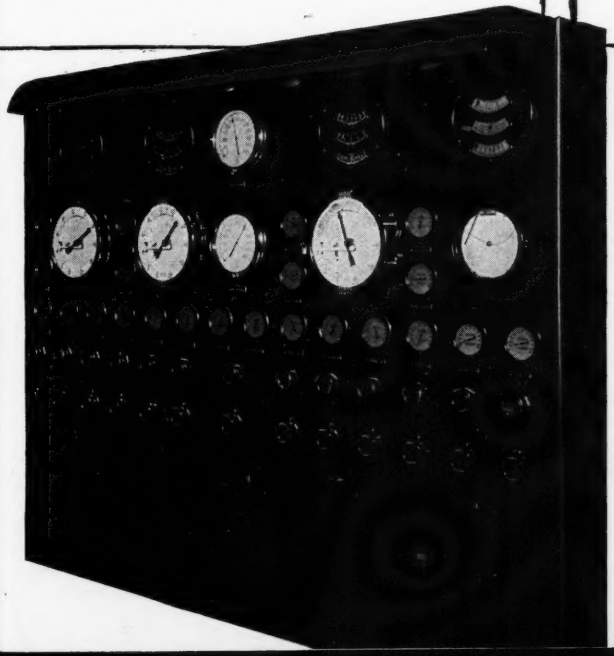
how to help whip them

FUEL SHORTAGES

"Go easy on the gas" is a common warning today, but what about coal and oil? Fuel shortages can strangle production almost overnight. Savings of 3% to 6% are not unusual with *fully* automatic Hagan Control.

MAN POWER

Skilled operators are scarce. It takes time to train green replacements. By maintaining top efficiencies *automatically* and *continuously,* Hagan Control is particularly valuable during periods when your plant is temporarily undermanned.



Faced with any of these conditions, look into Hagan Automatic Combustion Control. A relatively simple, low-cost installation often is the remedy. We will gladly survey your needs without obligation. Write today—it is *worth* the effort.

. . .

Coal consumption *decreased 6.7% per k.w.h. by this installation of Hagan Automatic Combustion Control in a medium-sized power plant. Savings paid for the installation in less than a year.*

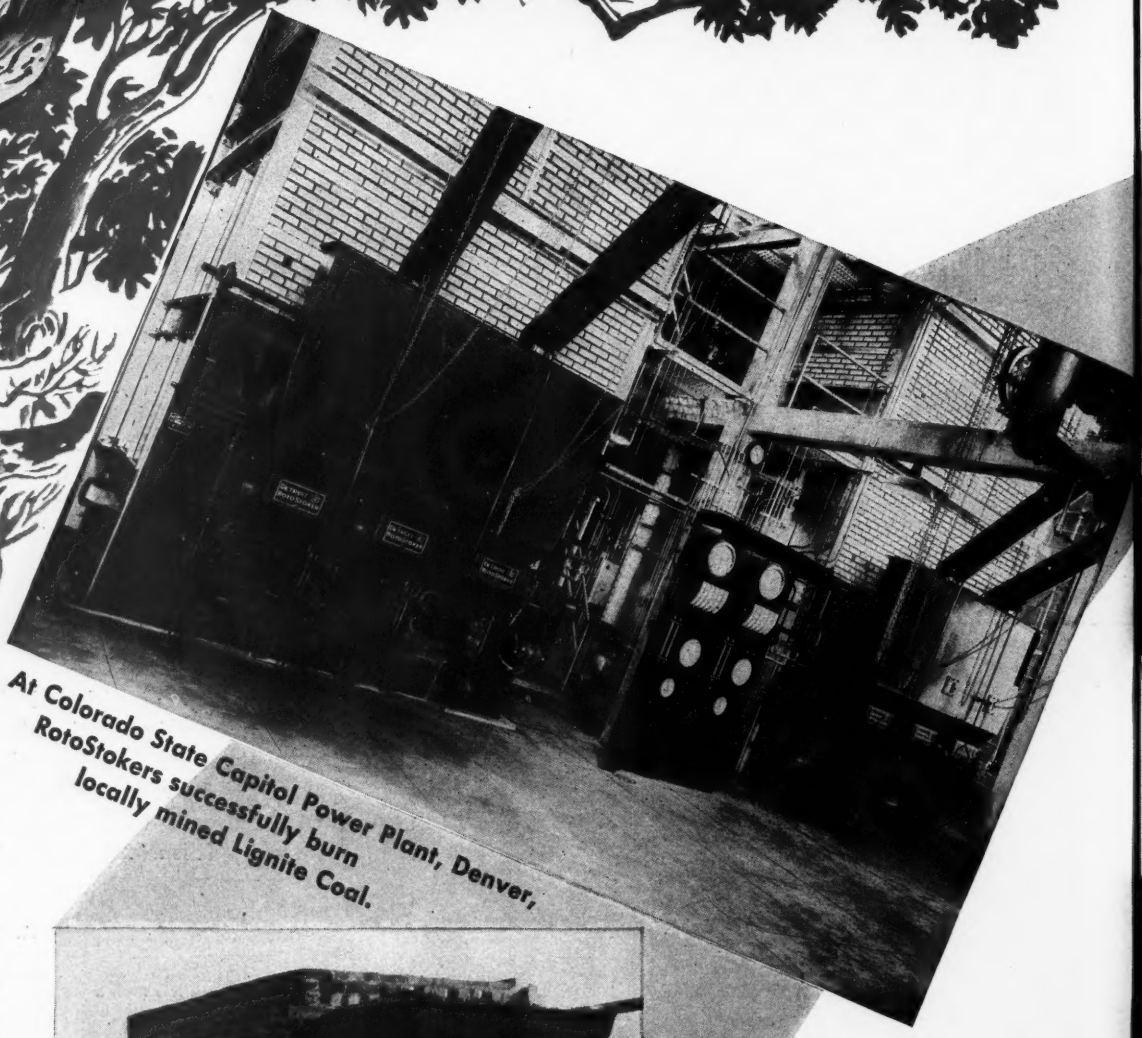
HAGAN CORPORATION
300 ROSS STREET
PITTSBURGH, PA.

HAGAN *Automatic* COMBUSTION CONTROL

The pioneer . . . and still the leader

TALL OAKS

From Little Acorns Grow

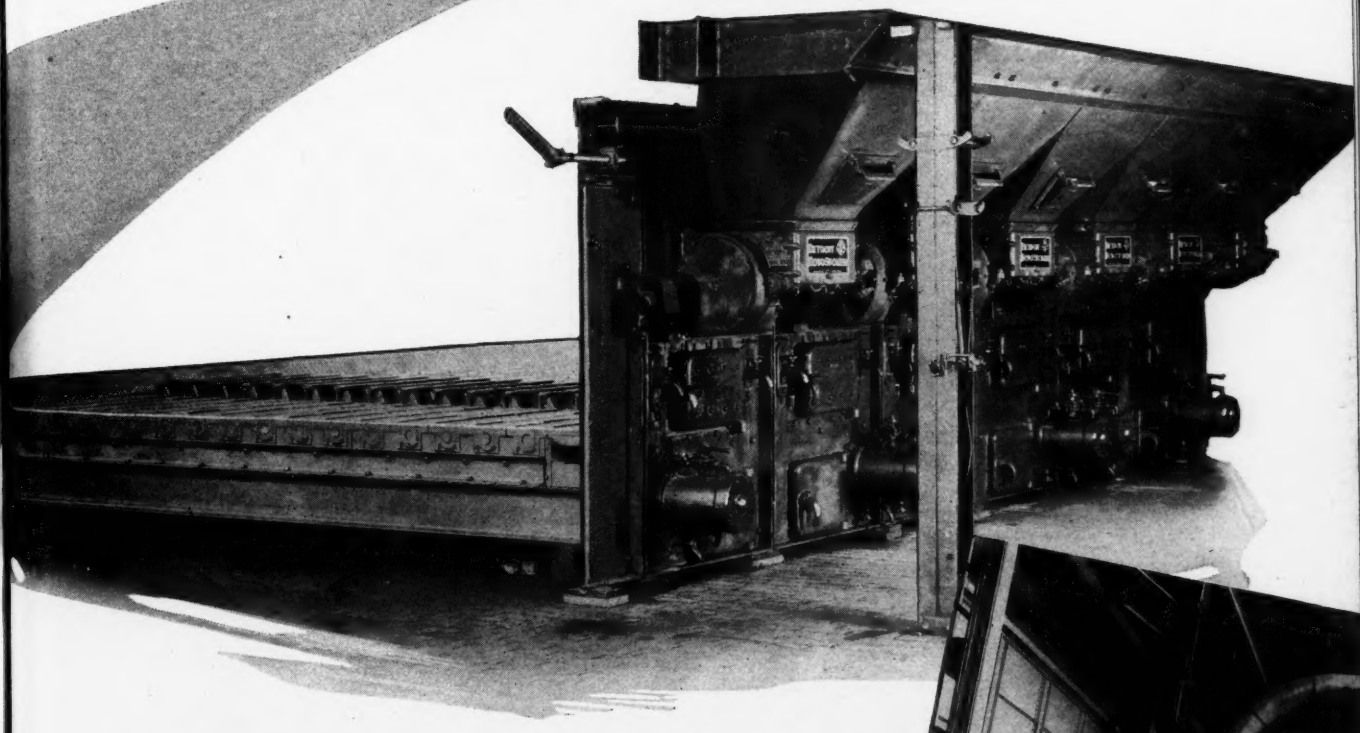


At Colorado State Capitol Power Plant, Denver, RotoStokers successfully burn locally mined Lignite Coal.

Operation of this small experimental model was observed under fire with various fuels.

DETROIT

Designed to generate over 100,000 pounds of steam per hour.



Months—even years of development work precede the final testing under fire of every type of Detroit Stoker. The RotoStoker was no exception. It took root from a small experimental model over ten years ago. From this, it has grown until large capacities are being generated with an extremely wide range of fuels.

Write for Bulletin 824

DETROIT STOKER COMPANY

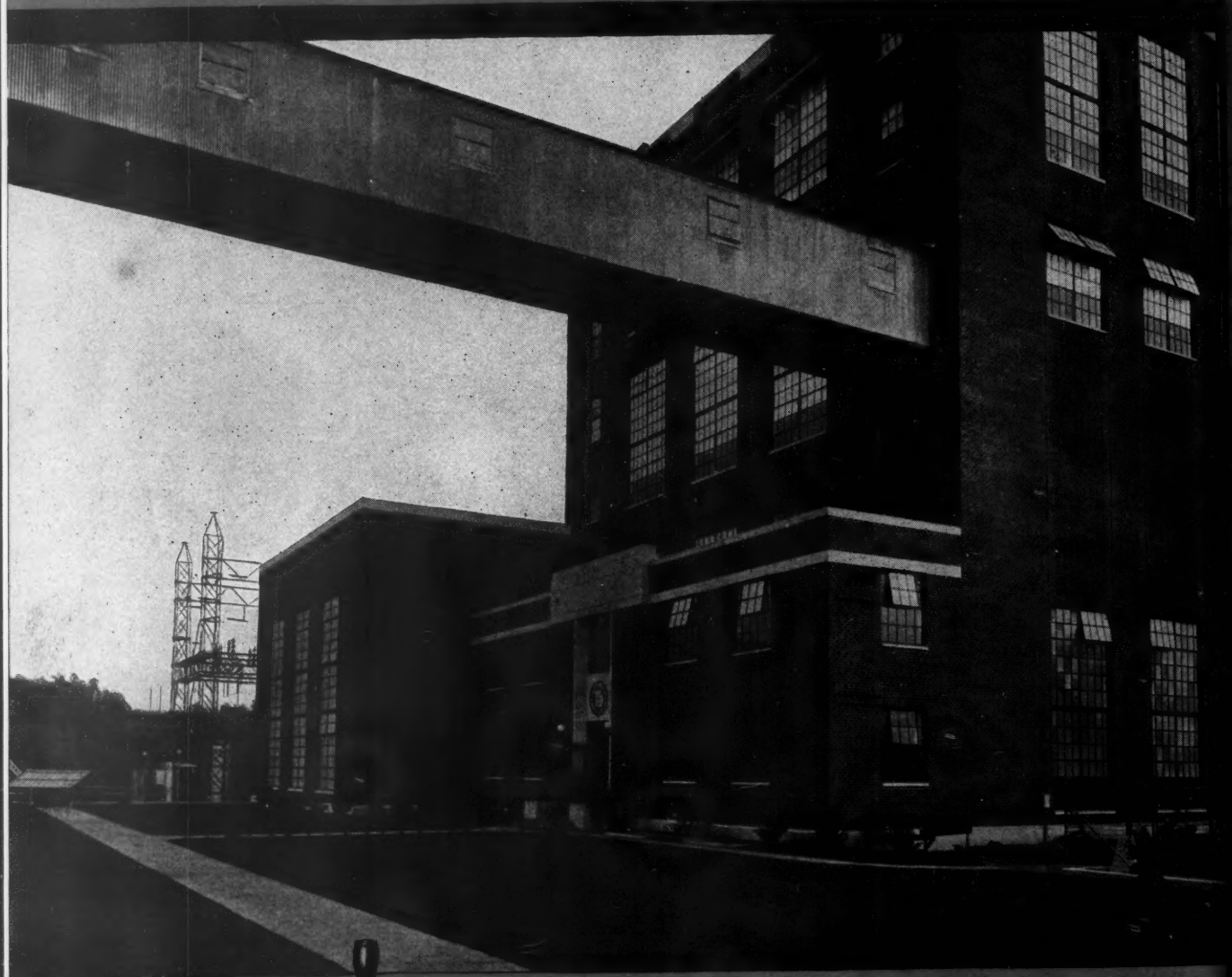
FIFTH FLOOR, GENERAL MOTORS BUILDING
DETROIT, MICHIGAN

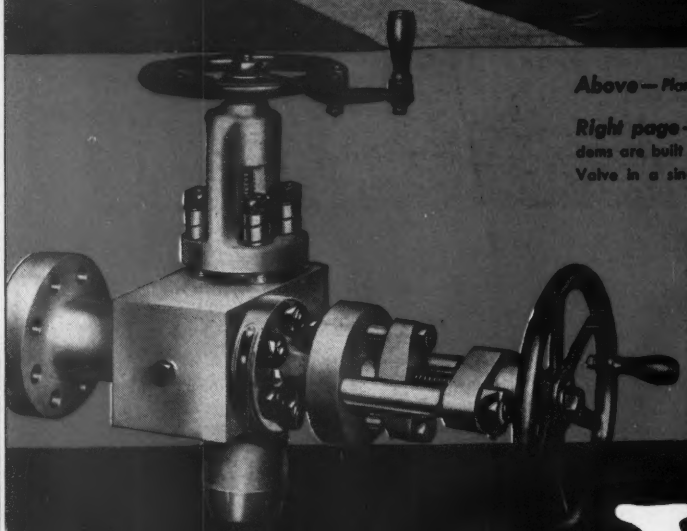
Main Office and Works—Monroe, Michigan

ROTOSTOKERS

Army Technical Aviation School Steam Generating Plant—200,000 pounds per hour—seven Detroit RotoStokers.

At Arkwright, Ga.,





Above *— Plant Arkwright, show place of modern efficiency in power generation.*

Right page **—Two views of the Yarway Unit-Tandem Valves at Arkwright. Yarway Unit-Tandems are built for pressures up to 2500 lbs per sq. in. Combining a Hard-Seat and a Seatless Valve in a single one-piece forged steel body, this Tandem provides the advantages of both designs—*for blowing and draining and for sealing*—in a compact, rugged unit.**

Inside (next to boiler) blowing valve is the Yarway Hard-Seat Valve which utilizes special Stellited seat and disc and unique construction features to resist wear in this type of valve. Outside sealing valve is the famous Yarway Seatless design which has no seat to score, wear and leak. This master valve is always opened first and closed last, maintaining a tight seal under expansion and contraction.

YARWAY

it's YARWAY Unit-Tandems Throughout

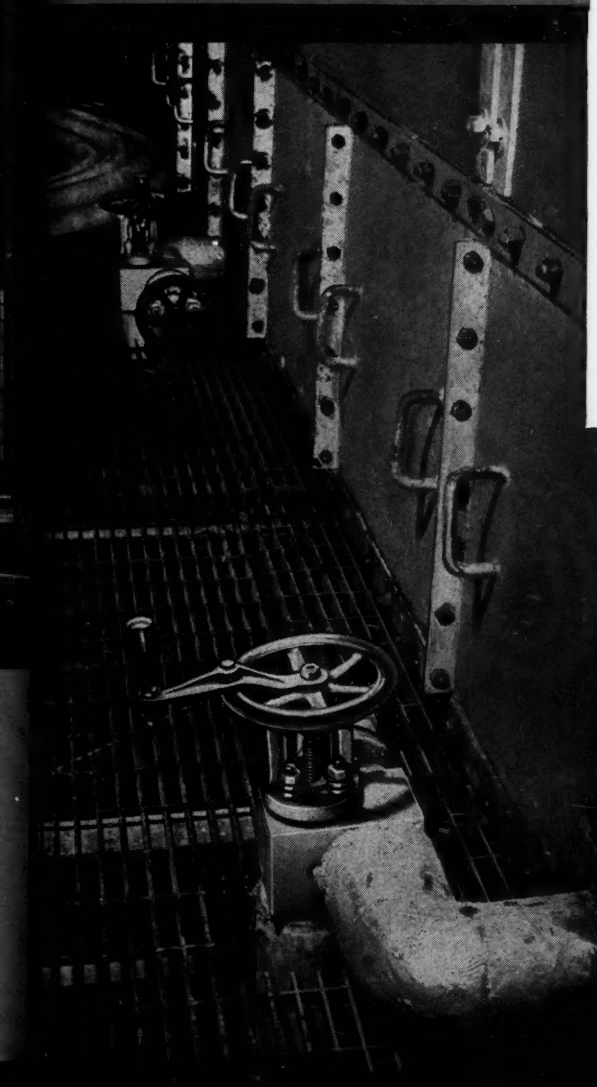
Plant Arkwright—modern steam plant built to augment the water power system of the Southeast—is a notable addition to the Georgia Power Company facilities.

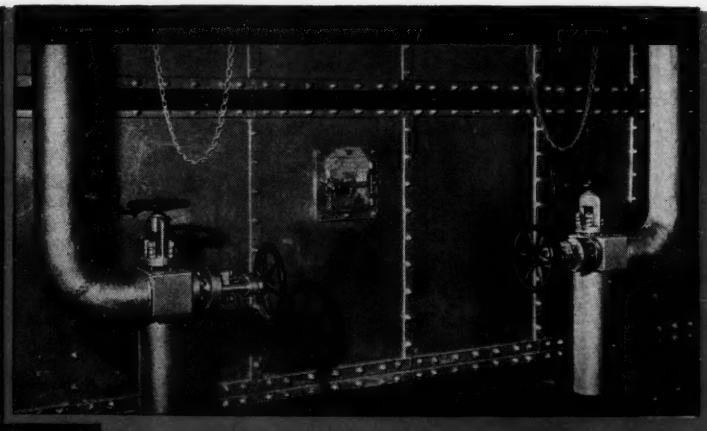
All three boilers of this high pressure plant are completely equipped with Yarway Unit-Tandem Blow-Off Valves—*equally suitable for blowing or draining and for sealing*—the valves that have made such records as "3000 blows at more than 1300 lbs per sq. in. pressure without replacement of a single part or repairs of any nature."

Good boiler engineering demands equally sound engineering in the accessories that become a part of it. It is not only protection for your investment, but cheap insurance against trouble and expense—the reason why most people specify Yarway Blow-Off Valves.

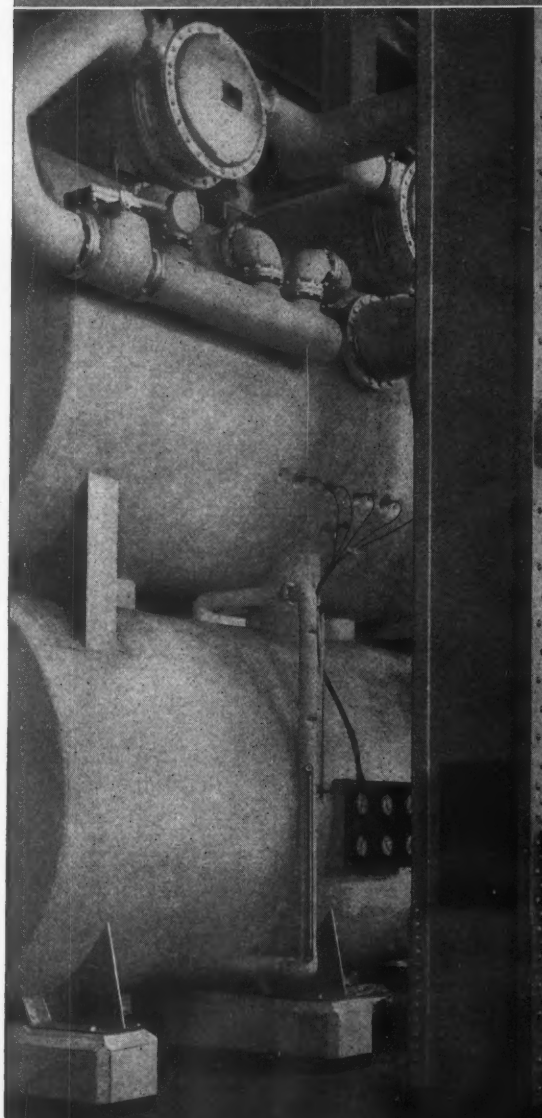
Write for Catalog No. 431 for pressures up to 2500 lbs. Catalog No. 421 for lower pressures.

YARNALL-WARING COMPANY
114 Mermaid Ave. Philadelphia, Pa.





BLOW-OFF VALVES



COCHRANE DEAERATORS *at* BUCK STATION DUKE POWER CO.

THIS new Cochrane Deaerator protects Unit No. 3 against oxygen corrosion at Duke Power's Buck Station in Spencer, North Carolina—as Cochrane Deaerators have protected the boilers, piping, and turbines of Units No. 1 and 2 since their installation in 1926.

Cochrane Deaerators are installed also at Duke Power's new Cliffside Station in Cliffside, North Carolina.

When Buck Station's Unit No. 4 goes on the line this June, the newest Cochrane Deaerator will go into operation, further evidence of the satisfaction in LETTING COCHRANE DO THE JOB.

COCHRANE CORPORATION
3123 N. 17th Street, PHILADELPHIA, PA.

Cochrane

WATER SOFTENERS · DEAERATORS · FILTERS · FLOW METERS

"Easier to Use"

MIDWEST BUTT-WELDING ELBOWS

Welders who have worked on all kinds of piping jobs frequently report that Midwest Welding Elbows are "easier to use" . . . this means an all important saving in time. Layout time is saved because all pipe can be cut in advance according to the drawings . . . time for lining up and tack welding is also reduced.

Midwest Butt-Welding Elbows are "easier to use" because of their greater dimensional accuracy and consistent uniformity. These qualities are inherent in Midwest Elbows because of their unique method of manufacture: they are *sized in compression* (not extruded or stretched) and an exact included angle is the result of special fixtures and tools developed by Midwest for machine-beveling the ends.

Bulletin WF-41 shows the other advantages of Midwest Elbows . . . and the complete line of Midwest Welding Fittings. Write for a copy.

MIDWEST PIPING & SUPPLY COMPANY, Inc.

Main Office: 1450 So. Second St., St. Louis, Mo.
Plants: St. Louis, Passaic (N. J.) and Los Angeles

Sales Offices: Chicago—949 Marquette Bldg. • Houston—229 Shell Bldg. Los Angeles—520 Anderson St. • New York—(Eastern Division) 30 Church St. • San Francisco—535 Call Bldg. • Tulsa—533 Mayo Bldg.

MIDWEST WELDING FITTINGS SAVE TIME, IMPROVE THE DESIGN, AND REDUCE THE COST OF PIPING SYSTEMS

THEIR TURBINES
OIL IS AMMUNITION
USE IT WISELY !

RUN LIKE "2 year olds"

SINCE SWITCHING TO TYCOL TURBINE OIL

Seven turbines — averaging about 13 years of service, although they still run like two year olds — are supplying power for about a half million people. One important reason why age is no handicap here is because Tycol Turbine Oil keeps turbines in the prime of life for long years, yet lasts almost indefinitely itself. The oil in these same turbines has already been in use for more than 32,000 hours and is still in excellent condition.

Possibly you are dissatisfied with some phase of your plant lubrication. If so call in a Tide Water engineer to survey your operations. He will recommend from Tide Water's complete line of industrial lubricants the one designed to do your job best. For full details write to the Tide Water Associated Oil Company, 17 Battery Place, New York, N. Y.

DRUMS! DRUMS! DRUMS! DRUMS! DRUMS!

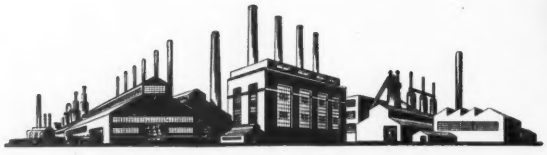
War needs make it extremely important that all empty drums be returned immediately.

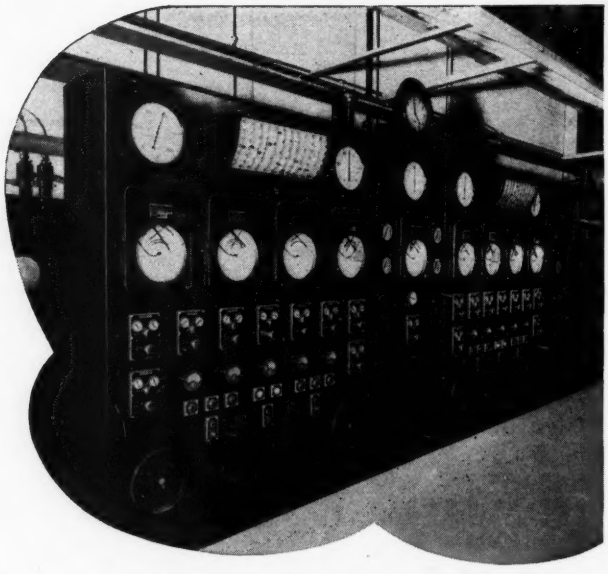
Regional Offices: Boston, Philadelphia, Pittsburgh, Charlotte, N. C.

TIDE WATER ASSOCIATED OIL COMPANY EASTERN DIVISION 17 Battery Place, New York, N. Y.

INDUSTRIAL TYCOL

MAKERS OF THE FAMOUS VEEDOL MOTOR OIL





This Bailey Boiler Control Panel serves multi-fuel fired boilers in a Steel Mill.

WAR STRATEGY *for* POWER ENGINEERS

1. Make Full Boiler Capacity Available
2. Conserve Fuel and Man Power
3. Prepare to Train New Operating Crews
4. Take Steps to Insure Continuity of Service
5. Protect Men and Equipment Against Accidents

★ Our fighting forces will win the war if our productive forces do not lose it by delivering" too little and too late." Every Power Engineer should map his war strategy now. We offer the following suggestions;

1. Make Full Boiler Capacity Available—by cleaning and repairing boilers and furnaces, by providing sufficient natural or mechanical draft, by continuously maintaining excess air at the minimum economical value, by careful fuel selection, and by basing both manual and automatic operation on accurate measurements.

2. Conserve Fuel and Man Power—by use of a coordinated boiler control for combustion, feed water, superheated steam temperature, heater and storage tank levels. The combustion control system should automatically make any readjustments necessary to maintain maximum fuel economy.

3. Prepare to Train New Operating Crews—by writing a clearly worded schedule of operator's duties, by reducing operation to its simplest form through the use of meters and control.

4. Take Steps to Insure Continuity of Service—by setting up a schedule for routine inspection of power equipment, by improving and coordinating operation to avoid unnecessary strain on any of the units in the system. Complete combustion control and properly applied feedwater control systems are of great aid in maintaining uniform safe operation.

5. Protect Men and Equipment Against Accidents—by the addition of interlocks and alarms to the boiler control system. Serious accidents resulting from fan failure, flame failure, high or low water levels, and other unusual conditions may be avoided by these devices.

It is hoped that the foregoing suggestions may give you some help in formulating a war strategy which will help to keep your plant out of the "too little and too late" group. We shall be glad to make specific recommendations on how to include metering and control equipment in your war strategy. A-82

BAILEY METER COMPANY
1040 IVANHOE ROAD, CLEVELAND, OHIO
Bailey Meter Company Limited, Montreal, Canada

BAILEY METER CONTROL

The Complete Combustion Control System

BOILER METERS • MULTI-POINTER GAGES • FLUID METERS • RECORDERS • SUPERHEAT CONTROL • DESUPERHEAT CONTROL • COMBUSTION CONTROL • FEED WATER CONTROL

DO YOU KNOW THIS — ABOUT WATER-COOLED STOKERS?

WATER-COOLED wins in the Mid-West

A central city mid-western plant, to assure minimum stack discharge nuisance, finally selected a Taylor Water-Cooled Stoker for its reliability, flexibility and freedom from fly ash.

Using this Equipment

A 600 H.P. Straight Tube Boiler with Economizer and Vertical Side and Rear Water Walls Maximum Capacity—75,000# Steam Per Hour.

Taylor Water-Cooled Stoker, 7 Retorts 37PC7; 181.7 sq. ft. driven with constant speed motor and Reeves Transmission.

And Coal of this Analysis...

APPROXIMATE

	Moisture	Volatile	Fixed Carbon	Ash
Kansas—Raw 1.....	7.0	36.0	42.0	15.0
Raw 2.....	5.4	34.82	49.74	10.4
Washed 3.....	7.0	37.0	45.0	11.0
Occasional....	5.0	34.53	53.69	6.78

ULTIMATE

	Sulphur	Carbon	Oxygen	BTU as Rec'd	Fusing Pt. of Ash Deg. F.
Kansas—Raw 1...	3.6	69	7.0	11,400	1975
Raw 2...	3.68	67	9.0	12,629	2280
Washed 3...	2.68	70	7.0	12,400	2150
Occasional..	4.20	54	6.8	13,250	—

They Obtained these Results

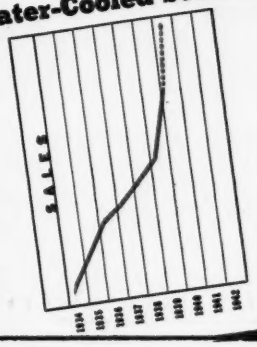
Period	April 22, '39 to December 31, '41 incl.
Total Steam Generated	579,921,000 lbs.
Total Coal Burned	63,228,145 lbs. (31,614 tons)
Aver. Evaporation (Lbs./Lb. Coal)	9.17
Aver. B.T.U. Coal As Fired	12,570
Aver. Operating Conditions	
Pressure	400 lbs. G.
Total Steam Temperature	695°F.
Feed Temperature to Economizer	218°F.
Combined Efficiency	85.4%
Cost of Material for Stoker Repairs	$369.10
Average Cost of Material per Ton of Coal Burned	$.0116

Improves Operation 3 Ways

Taylor Water-Cooled Stokers improve operation in over a dozen ways—most important by 1. Increasing reliability, 2. Increasing fuel flexibility, 3. Higher operating efficiency. Do you know how they are accomplished?

Factful information on the advantages, construction and installations of Taylor Water-Cooled Stokers is contained in a new booklet ready now.

What's behind the big rise in Taylor Water-Cooled Stoker sales?



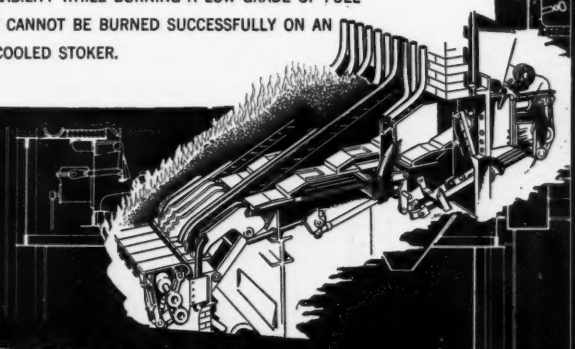
Slowly, painstakingly developed for more than 15 years, Taylor Water-Cooled Stokers have suddenly shot upward in acceptance by leading power plant engineers. Let Catalog W (below) show you why.

They "asked a man who owned one" and this is how he replied...

WESTERN UNION

NA169 43 NT 1 EXTRA- 18

OUR WATER COOLED STOKER IS VERY RELIABLE AND FLEXIBLE WITH LOW MAINTENANCE AND HIGH AVAILABILITY WHILE BURNING A LOW GRADE OF FUEL THAT CANNOT BE BURNED SUCCESSFULLY ON AN AIR COOLED STOKER.



A-E-CO TAYLOR WATER-COOLED STOKER

AMERICAN ENGINEERING COMPANY

A-E-CO TAYLOR STOKERS • WATER WALLS • ASH HOPPERS • LO-HED HOISTS • MARINE DECK AUXILIARIES • HELE-SHAW FLUID POWER PUMPS

AMERICAN ENGINEERING COMPANY, 2408 Aramingo Ave., Phila., Pa.

Please send me your 8-page Catalog W on Taylor Water-Cooled Stokers, without obligation.

*Name*_____

*Company Name*_____

*Address*_____

*City*_____ *State*_____

GETTING THE *MOST* FROM YOUR THERMAL INSULATIONS...

MAKE CERTAIN THE
THICKNESS
IS ADEQUATE...
NUMBER 3 in a series of messages to American industry devoted to conserving heat, improving operation . . . and increasing production through modern insulation practice.

Official U. S. Navy Photograph

To hasten the winning of today's battle of production, fuel must be conserved—steam pressures and process temperatures must be maintained. Improvement in boiler plant efficiency that results from using thicker insulation often obviates the necessity for installing additional boilers and equipment. There is no skimping of material when armoring the turret of a battleship. Thicknesses are great enough to fully protect the guns and gunners. Similarly, the thermal insulations which are industries' armorplate against the waste of heat should be thick enough to prevent such losses.

The insulations on your boilers, piping and equipment should be checked at frequent intervals, as a guard against unseen losses. And when insulations are specified for new construction, make sure they are thick enough to really do the job.

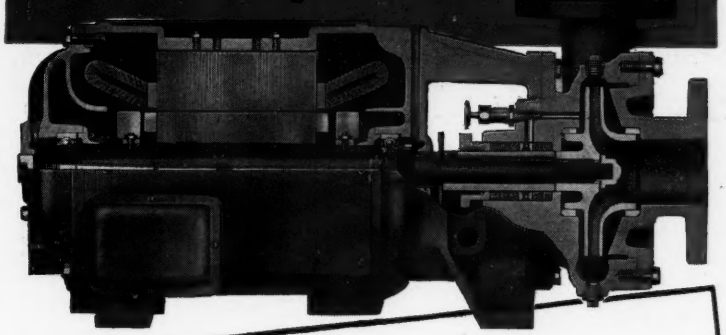
★ EHRET'S 85% MAGNESIA and other Ehret heat insulating materials are fully treated from the standpoint of characteristics, selection and application in a new 176-page Heat Insulation Handbook. It will be sent, without obligation, to anyone interested in getting the most from thermal insulations. Write for your copy of Handbook B206

EHRET MAGNESIA MANUFACTURING CO.
VALLEY FORGE, PENNA.

...THERE IS AN *EHRET* DISTRIBUTOR OR CONTRACTOR IN EVERY INDUSTRIAL AREA

FOR TRIPLE-SHIFT DUTY!

ALLIS-CHALMERS ELECTRIFUGAL PUMPS



New Allis-Chalmers "One Package" Pumps are 5-Way Winners in Giving You More Pumping Dependability!

THREE SHIFTS a day . . . efficient, dependable, economical operation every day of the week — that's what wartime industry expects of its pumping equipment.

And that's exactly the kind of service you get with the new Allis-Chalmers Electrifugal Pump . . . better in 5 important ways!

For with this new pump — compact construction with motor and pump on one shaft and in one housing saves you as much as 33% in space, cuts pump overhang as much as 40%. Unified "Tri-fit" design requires but three of the five section fits normally required . . . resulting in fewer parts to wear and more positive shaft alignment.

In addition — you get a new motor, completely splash-proof, 100% designed for pump drive . . . with indestructible rotor and distortionless stator.

Important too—these pumps are available to you in sizes from ½ hp to 25 hp (in most cases right out of stock) . . . at an actual saving to you in initial cost of up to 33%.

For complete information on this "one package" pump, call the engineer in the district office near you. Or write Allis-Chalmers, Milwaukee, Wisconsin.

A 1496

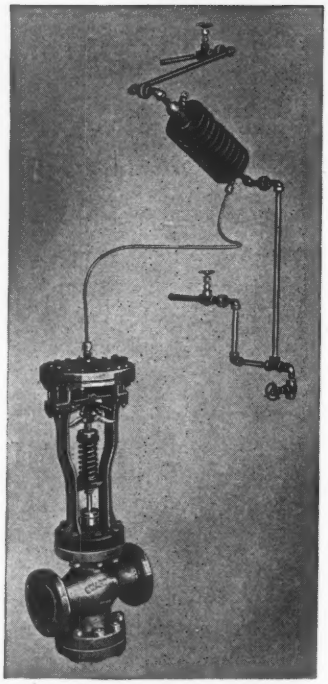
✓ Check These Great One-Package Features

1. *Up to 33% Space Saved* with one frame, one solid driving shaft construction.
2. *Overhang Cut as Much as 40%.* Four solid supports assure precision balance . . . ease strain on vital parts.
3. *New Tri-Fit Design* eliminates 2 section fits for more positive shaft alignment, wearless and vibration-free performance.
4. *Splash-Proof* Motor standard equipment . . . 100% designed for pumping.
5. *Easy-to-Get-at* Casing simplifies stuffing box and waterseal gland inspection.

Allis-Chalmers Pumps Can Cut Your Pumping Costs

ALLIS-CHALMERS
MILWAUKEE · WISCONSIN

Nearly 600 complete Swartwout Feed Water Regulators chosen for critically important sea service



because they've given break-down-proof service in thousands of stationary plants like yours . .

Driving your plant to the utmost as you probably are, you can't overlook the tremendous importance of positive, consistent feed water regulation. The Swartwout "S-C" System has a sound record of trouble-free performance—assuring sensitive quick-acting control that protects your boilers from dangerous water stages. Used on boilers from lowest pressure jobs to 2000 pound pressure central stations, its low maintenance has surprised and pleased thousands of engineers ● It's no wonder, then, that Swartwout Feed Water Regulators (600 lb. standard) are being used on nearly 600 new sea-going vessels—a service that is usually the most severe test for any equipment, for marine specifications are exacting ● A simple, dependable system—the generator at the boiler drum connects only by a small flexible tube to the regulating valve in the feed line. *Ruggedly built to operate under severe conditions. Easily installed on any boiler—easily adjusted to varying requirements. Special hook-ups may include extra safety features that Swartwout has developed in over 37 years experience.*

Feed Water Regulators • Pump Governors • Feed Water Heaters
Master Controls • Reducing Valves • Separators • Exhaust Heads

Swartwout

•Power Plant Equipment•

THE SWARTWOUT COMPANY
18541 Euclid Avenue • Cleveland, Ohio

* * *

Controlled **AIR CIRCULATION**
for Power Plants and Industrial Buildings

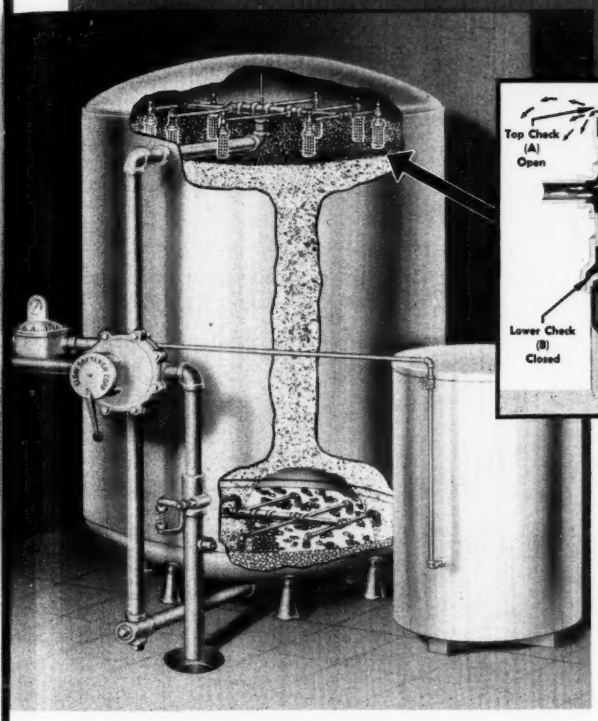
44% MORE CAPACITY*

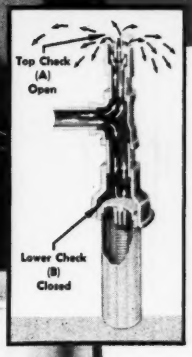
with ELGIN "DOUBLE-CHECK" WATER SOFTENER EQUIPMENT

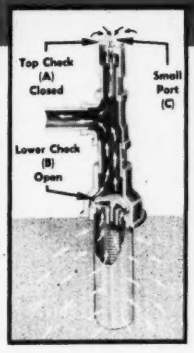
New operating principle also applicable to your present softener

PLUS THESE OUTSTANDING FEATURES:

- Prevents zeolite loss
- Uses less salt
- Stops packing and channeling
- Gives better backwashing
- Costs less, capacity considered







● View 1 shows "Double-Check" principle during service (softening). View 2 shows action when backwashing. Special strainer nozzles permits far deeper softening bed without zeolite loss — makes rapid, non-packing, non-channeling full-washing flow rate possible. Small port (c) carries off floated sediment.

Tomorrow's Water Softener . . . Today!

THE Elgin "Double-Check" Water Softener is the newest development in the field. An entirely new type of water distributing and collecting manifold system, equipped with ingenious "Double-Check" valves and strainer nozzles permit carrying a far deeper bed of zeolite without zeolite loss. The new operating principle of this type softener also provides more effective backwashing, more efficient regeneration, and a new self-cleaning action. These and other features provide up to 44% more softening capacity; assure delivery of completely softened water; cut salt and wash water requirements; and step up over-all efficiency as compared with other type softeners.

Can Be Applied to Your Present Softener

The new manifold arrangement required can be installed quickly and at low cost to give your present softener the outstanding "Double-Check" features cited above. No new tanks to buy—no replacing of zeolite.

Write for Bulletin 605

*Applies to synthetic zeolite units. Proportionate increases secured with greensand zeolite units.

ELGIN
Water Conditioning for Every Need

➡ DECONCENTRATOR

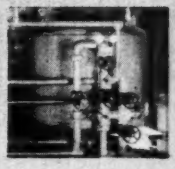
Simple boiler attachment for clarification of boiler water. Sludge, mud and suspended matter is trapped and removed in clarification chamber without wasteful blowdown. Clarified water is returned to boiler.

➡ CONTINUOUS BLOWDOWN HEAT EXCHANGER

Maintains uniform boiler water concentration. Prevents priming, foaming, wet steam. Eliminates wasteful blowoff. Recovers heat from blowdown. Built with or without Flash Tanks—high, low or multiple-stage design.

➡ WATER FILTERS

Built in all sizes—Pressure Sand Filters, Activated Carbon Purifiers, Oil Removal Filters—for any service.



➡ CHEMICAL TREATMENTS

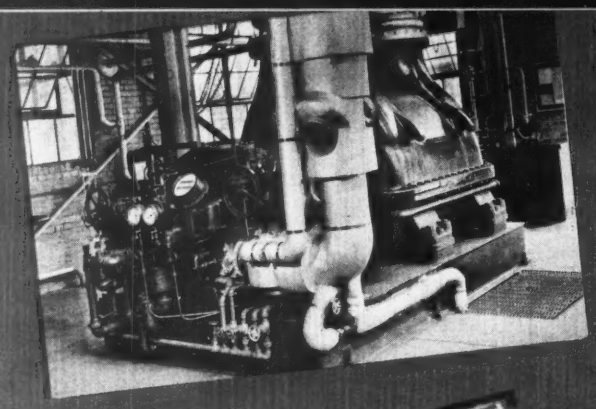
Individually prepared Internal Boiler Feedwater Treatment, Post Treatment, Inhibitors and other Water Treating Chemicals — Laboratory and field service given to users without charge.

➡ Aerators
➡ Water Testing Equipment
➡ Zeolite

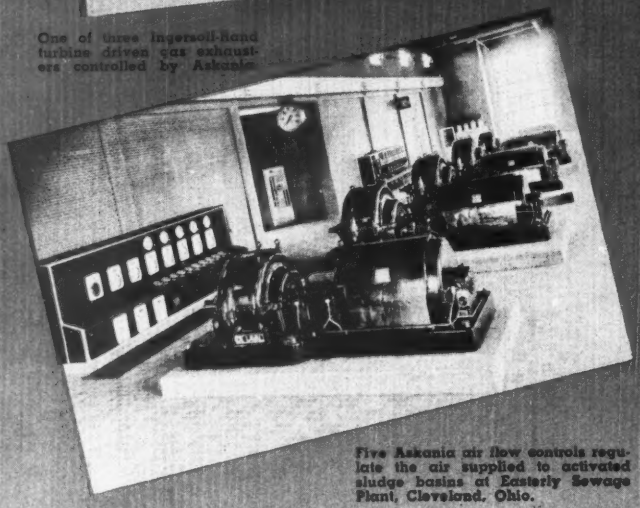
Write for Bulletins

ELGIN SOFTENER CORPORATION, 136 North Grove Avenue, Elgin, Illinois

Water Conditioning Products



One of three Ingersoll-Rand turbine driven gas exhausters controlled by Askania.



Five Askania air flow controls regulate the air supplied to activated sludge basins at Easterly Sewage Plant, Cleveland, Ohio.

Protect your prime movers with ASKANIA CONTROL

MORE than ever now, you need control equipment that will not only give you accurate control, but complete protection of your investment. Askania control does this through the simple hydraulically operated jet pipe principle.

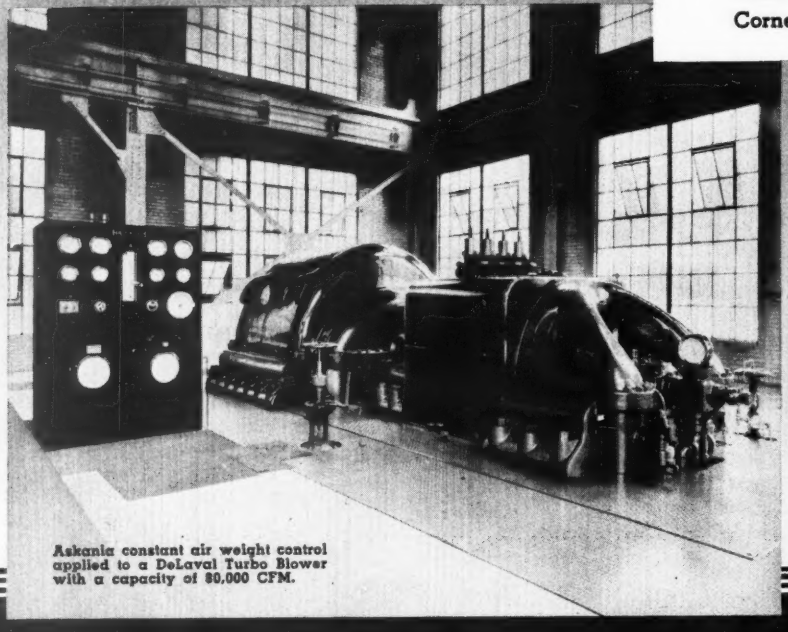
Here are a few of the many applications that have proved the value of that better operation that comes with Askania control.

- Turbine Bleeder Control
- Turbine Back Pressure Control
- Turbo-Blower Control
- Turbo-Exhauster Control
- Turbo-Booster Control
- Pressure, Flow and Suction Control for Parallel Operated Units
- Speed and Governor Control
- Volume and Pressure Control to Prevent Pumping

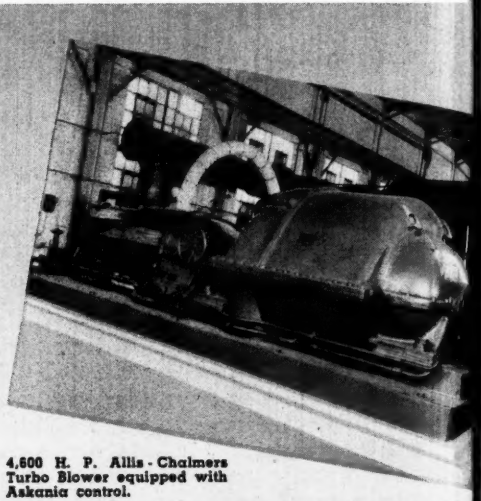
Only the best equipment has a place in America's War Industry, and when it comes to automatic control for Prime Movers, that means *ASKANIA*.

Write for information on any problem involving pressure, flow, proportioning or boiler combustion control.

ASKANIA REGULATOR COMPANY
Corner 16th and Michigan, Chicago, Illinois



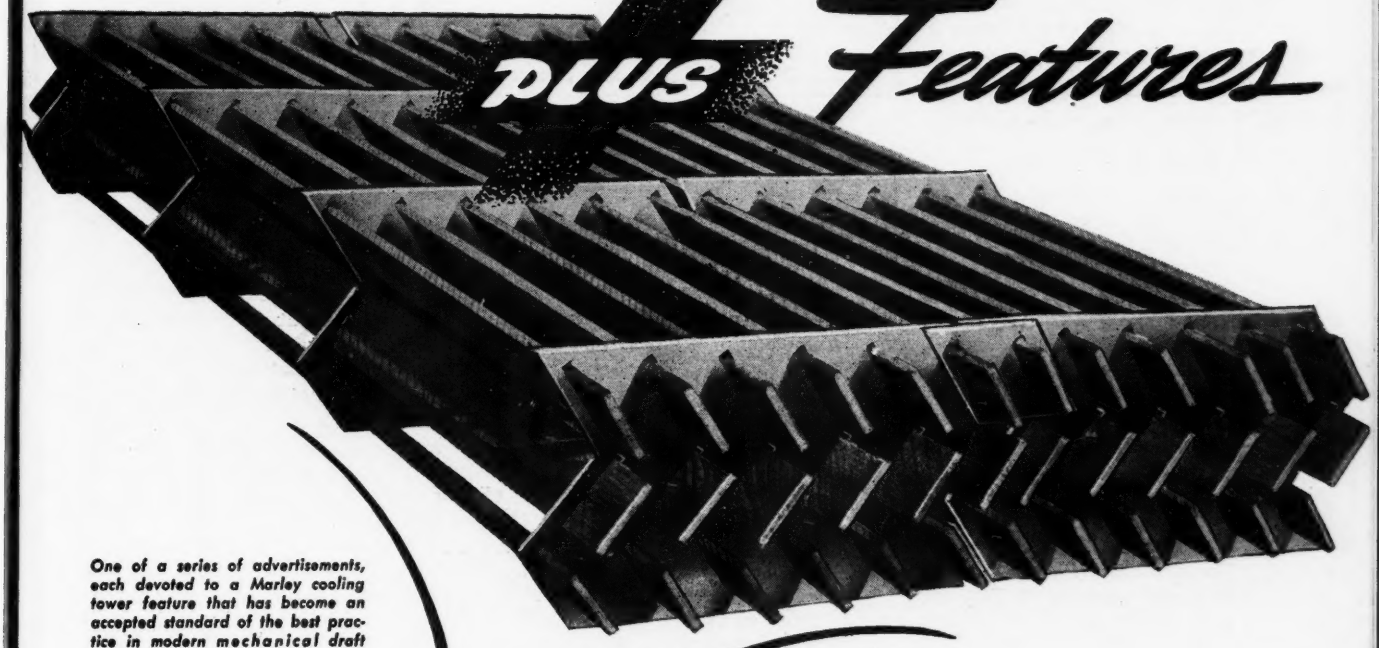
Askania constant air weight control applied to a DeLaval Turbo Blower with a capacity of 80,000 CFM.



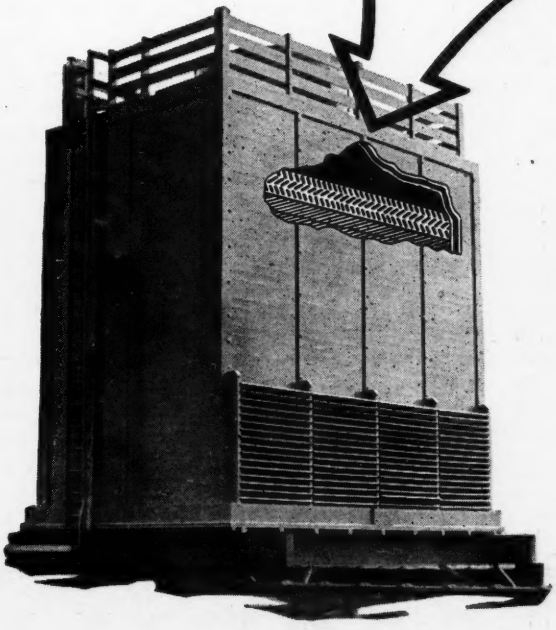
4,600 H. P. Allis-Chalmers Turbo Blower equipped with Askania control.

ASKANIA
REGULATOR CO. CHICAGO
AUTOMATIC CONTROL

Another of MARLEY'S PLUS Features



One of a series of advertisements, each devoted to a Marley cooling tower feature that has become an accepted standard of the best practice in modern mechanical draft water cooling.



MARLEY'S patented **Drift Eliminator,** of which the above is one section or "bundle," permits less than a tenth of one percent of "drift" moisture to escape from Marley Mechanical Draft Cooling Towers.

Its freedom from maintenance troubles is due to ingenuity both in design and materials. Frames of *Presite* composition are slotted to receive Redwood blades, making up easily-handled "bundles" without nails, bolts or other rigid fastenings. No metal parts to corrode or break! Blades are held in precise spacing and alignment yet are free to expand and contract without warping or stress. No snapped blades or twisted sections!

This triple-effect zig-zag design pioneered by Marley more than ten years ago has become the recognized optimum for *maximum moisture-stoppage* with *minimum resistance to air flow*. That has meant total absence of drift nuisance and considerable savings on fan power to owners of the many hundreds of Marley mechanical draft towers in which nearly two million square feet of these eliminators are installed.

The Marley Drift Eliminator is just one of the many exclusive features which account for so many more cooling towers bearing the Marley name.

MARLEY COOLING TOWERS

Every MARLEY TOWER *is individually engineered by* THE MARLEY CO., INC. — KANSAS CITY, KANSAS

"Phosphorized Admiralty Tubes"*

After 36 Months of Volume Commercial Application

Since 1939 when Phosphorized Admiralty Condenser Tubes were introduced, several million pounds have been installed in public utility, industrial, marine and refinery services. This three-year period of large volume commercial use has borne out the laboratory test indications that the addition of Phosphorous to admiralty metal tubes inhibits dezincification and increases service life in installations where dezincification is a corrosion factor.

The marked influence of a very small percentage of Phosphorous in controlling this form of corrosion of Brass has been the subject of considerable research. In this connection, much interest has been shown not only in the actual ability of Phosphorized Admiralty and other phosphorized brasses to inhibit dezincification but in the reasons for the beneficial effect imparted to such alloys by Phosphorous.

Several theories have been advanced and much investigational work has been carried out to explain the inhibiting action of Phosphorous in brasses under service conditions which would normally result in dezincification of the metal. This problem will be better understood by a consideration of the properties of Phosphorous and its compounds.

Phosphorous is non-metallic in character and enters into combination with Oxygen to form a series of oxides. From Phosphorous and its various oxides, a number of metal salts may be obtained. With the exception of Sodium and Potassium salts, these metal compounds are, in general, insoluble in water. In some cases, these salts exhibit colloidal properties to some degree. The end product of the oxidation of Phosphorous gives ortho-phosphates and, in the presence of sufficient Oxygen, ortho-phosphates will be found.

One interesting detail in connection with the compounds of Phosphorous is the behavior of Tin and Phosphorous when they are present in the same solution. Tin Oxide in colloidal solution readily takes up or absorbs Phosphates and this reaction usually hastens the precipitation of Tin in a very insoluble form. It was earlier believed that this reaction was entirely of a colloidal nature, but, recently, it has been shown that a definite compound of Tin Phosphate is formed, at least in certain conditions. This particular reaction between Tin and Phosphorous compounds is stressed because it has been noted in a research on the dezincification of brasses that the presence of Tin in itself retards dezincification to some extent; but the addition of Phosphorous (as in Phosphorized Admiralty metal) is necessary to prevent dezincification of the alloy.

If the foregoing discussion of the formation of insoluble and colloidal metal salts of Phosphorous is remembered, the dezincification-resistant property imparted to Brass by the addition of Phosphorous can more readily be explained. In services where dezincification of Admiralty metal or other brasses has been experienced, the phosphorous content of the dezincification-resistant alloys probably promotes the formation of a protective film (in the nature of a metal phosphate or phosphide such as Copper Phosphide Cu_3P_2), which coats the metal surface at initially corroded areas and arrests further action at such areas.

The reactions which take place in the formation of the phosphorous containing film may or may not be complex in nature, as may be anticipated from the above remarks on the chemical reactions of Phosphorous. Thus, in the early stages of corrosion, Phosphorous, together with Copper, Zinc and Tin may pass into solution and the Phosphorous may then combine with certain of the metal ions in solution to form an insoluble compound which coats the metal surface as a stable impervious film. The formation of this compound may involve nothing more than introduction of ions of the reacting elements into the solution, followed by precipitation and deposition of certain combinations of such ions on the metal surface.

It is probable, however, that a more complex series of reactions takes place and may be better explained by considering the existence

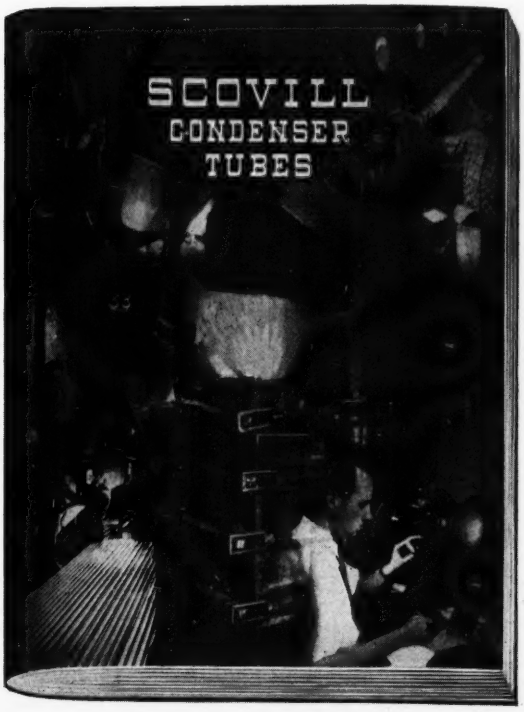
* "Phosphorized Admiralty Tubes" for condenser and heat exchanger service are covered by patent 2,224,095 and can be legally supplied only by Scovill Manufacturing Company, the owner of this patent.

Scovill
MANUFACTURING COMPANY
WATERBURY, CONN.

SCOVILL
one product . . .
SERVICE IN MANUALS . .

of colloids in the medium in contact with the metal surface. In this connection, it may be pointed out that very minute quantities of colloids in a solution often-times produce a profound change in the behavior of such solutions. In the plating of metals, for example, colloids in the plating bath may alter the type of plate, may prevent plating altogether, or may change the conditions (current density, voltage, etc.) at which satisfactory plating may be carried out. The subject of plating is introduced in this discussion of colloids because dezincification may be looked upon as a plating operation in which Copper is plated upon the brass, usually in the form of a porous, brittle mass. In the case of Phosphorized Admiralty Tubes, colloidal Tin Phosphate or other metal phosphates may play an important part in preventing dezincification of the alloy.

Wherever dezincification of Admiralty metal tubes has been a serious corrosion problem, the use of Phosphorized Admiralty metal tubes is suggested. This alloy combines the general excellent corrosion-resistant properties of Admiralty metal, a desirable fine grain structure of the finished tubes, favorable physical properties and a very definite improvement over Admiralty metal in its very marked resistance to dezincification.



ONE PRODUCT
THREE SERVICES

There are three ingredients in a satisfactory condenser tube installation — *correct information* about the *proper metals* applied to the specific problem by *qualified experts* . . . Scovill provides the three ingredients. Information comes to you in the form of *manuals*. The *metals* include a broad list from which the proper alloy for your conditions can be selected. And the third ingredient is the *men* to combine information and metals into the correct answer for your problem.

All three services can be "sampled" by writing for our free Condenser Tube Booklet — containing information about the applications of Scovill Alloys prepared by Scovill engineers. Write Scovill Manufacturing Company, 17 Mill Street, Waterbury, Connecticut.

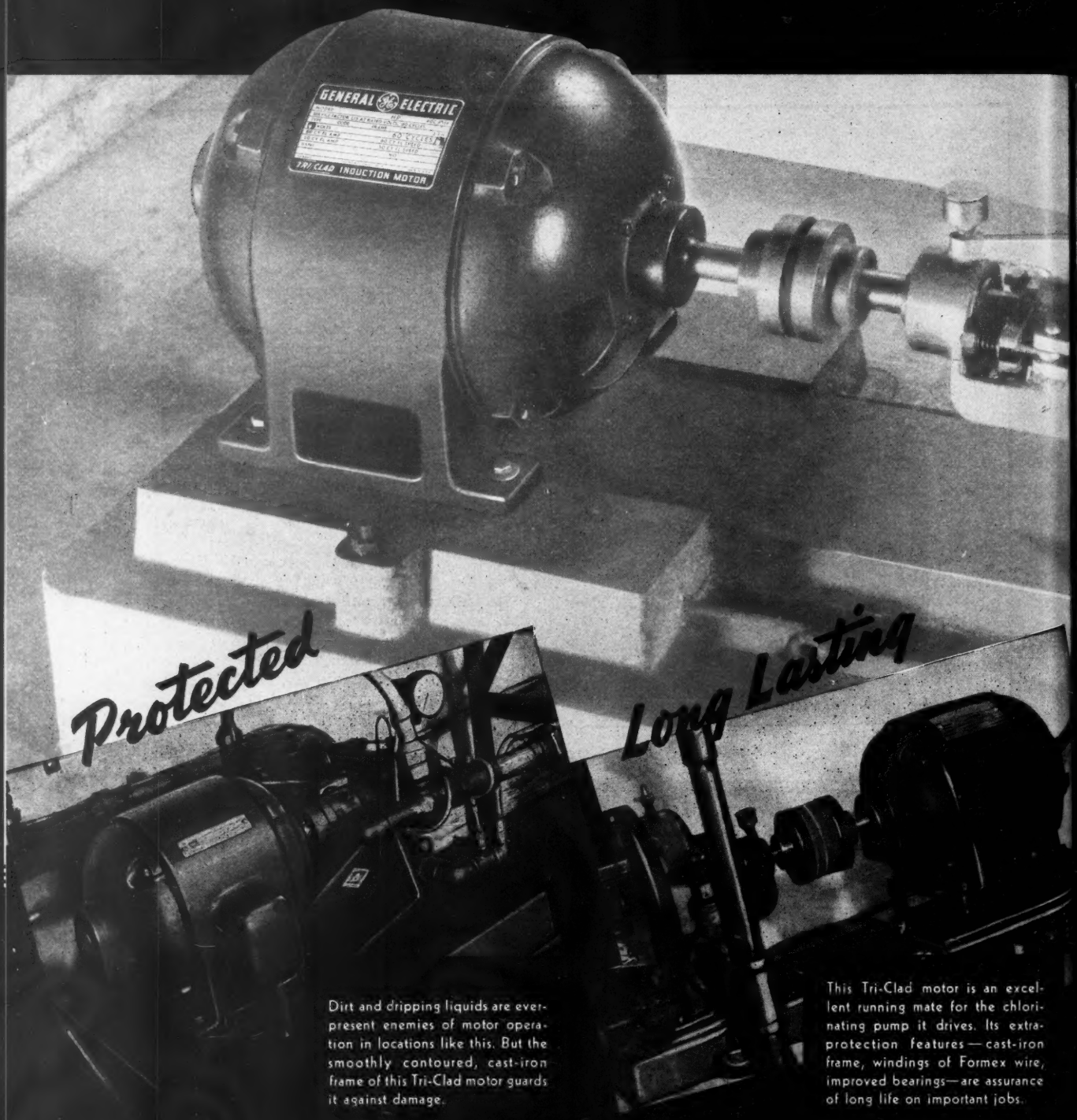
Scovill, for many years a regular source of supply for the U. S. Government, is cooperating in every way to forward defense plans. When deliveries are not as prompt as our customers desire, we hope they will realize that delays are sometimes unavoidable, and part of the price paid for National Defense.

Condenser Tubes

. . . three services

SERVICE IN METALS . . . SERVICE IN MEN

MORE" STAYING



Protected

Long Lasting

Dirt and dripping liquids are ever-present enemies of motor operation in locations like this. But the smoothly contoured, cast-iron frame of this Tri-Clad motor guards it against damage.

This Tri-Clad motor is an excellent running mate for the chlorinating pump it drives. Its extra-protection features—cast-iron frame, windings of Formex wire, improved bearings—are assurance of long life on important jobs.

BUILT FOR PROTECTION FIRST . . . TO LAST

POWER"

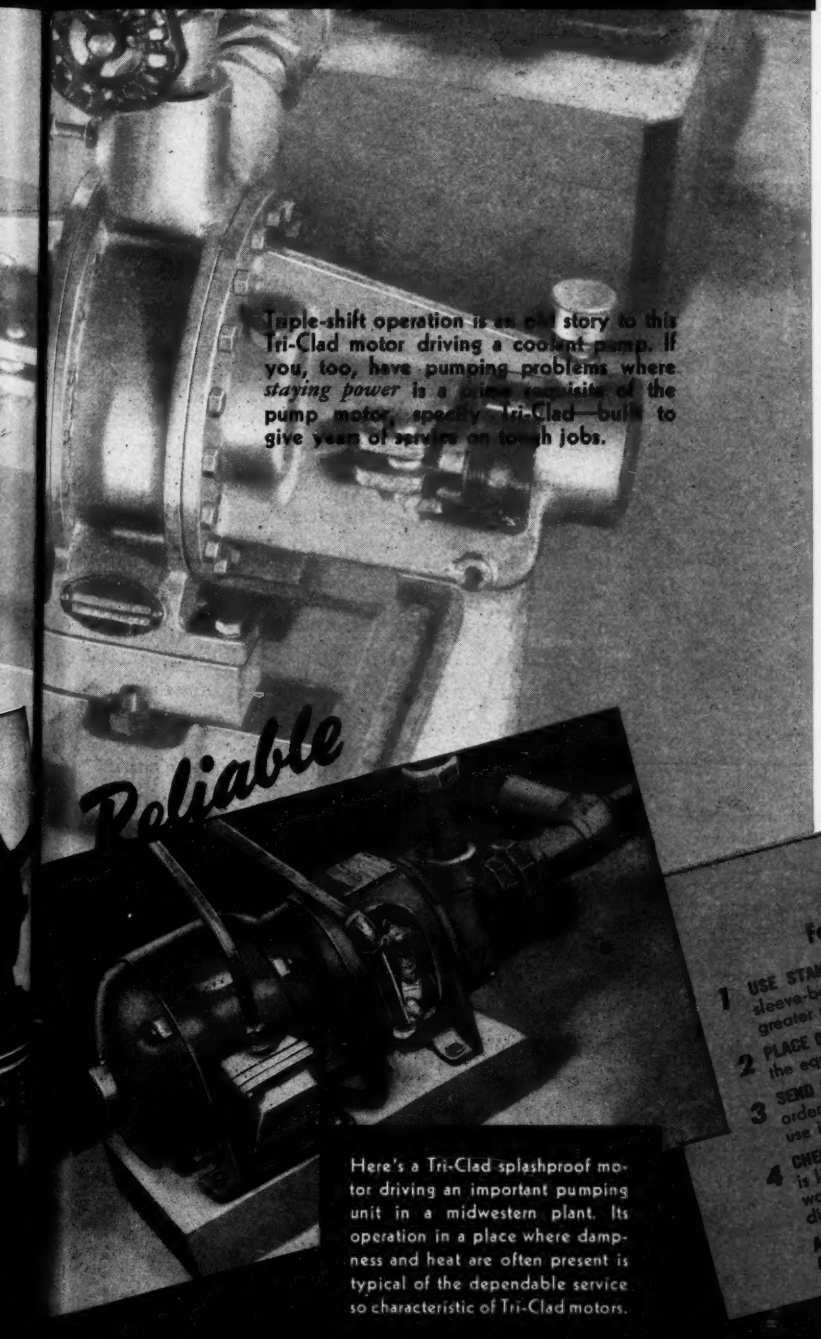
ON PUMPING JOBS

The extra protection of TRI/CLAD motors helps to keep pumps DELIVERING

NOW—before you buy motors—is the time to solve your pump-motor problems. Wherever continuous pumping is essential to your production—wherever pumps must operate under adverse conditions—your motors must be secure against (1) physical damage, (2) electrical breakdown, (3) operating wear and tear.

Here's where the *extra*-protection features of Tri-Clad motors will help you get the triple-shift operation you need. Their cast-iron frames and end shields exclude falling objects and dripping liquids; their windings, of Formex wire, are resistant to oil, moisture, and heat shock; their improved bearings, completely sealed in cast iron, are protected against the entry of dust and dirt. All these features add up to ***extra staying power*** on jobs where 24-hour production is essential.

You'll be glad to know that Tri-Clad motors are now available up to 100 hp in standard, open construction, and in a wide range of other types and ratings.



Triple-shift operation is an old story to this Tri-Clad motor driving a coolant pump. If you, too, have pumping problems where *staying power* is a prime requisite of the pump motor, specify Tri-Clad—built to give years of service on tough jobs.

Here's a Tri-Clad splashproof motor driving an important pumping unit in a midwestern plant. Its operation in a place where dampness and heat are often present is typical of the dependable service so characteristic of Tri-Clad motors.

NEED MOTORS?

Four Things to Do to Get Them Quicker

1 **USE STANDARD MOTORS.** Wherever possible, select standard, open, sleeve-bearing motors. Building fewer "specials" means faster and greater production of motors for you and others doing war work.

2 **PLACE ORDERS EARLY.** Order the motors when you order, or plan for, the equipment they are to drive.

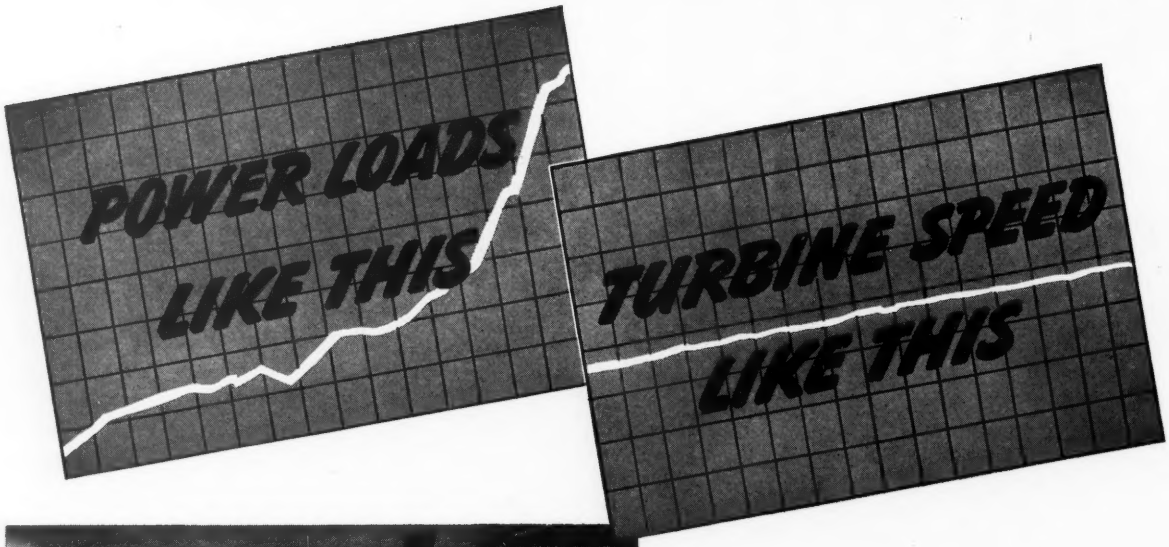
3 **SEND PROPER PRIORITY.** Be sure correct priority papers accompany your order and that the priority rating reflects the urgency of the motor's use in the war effort.

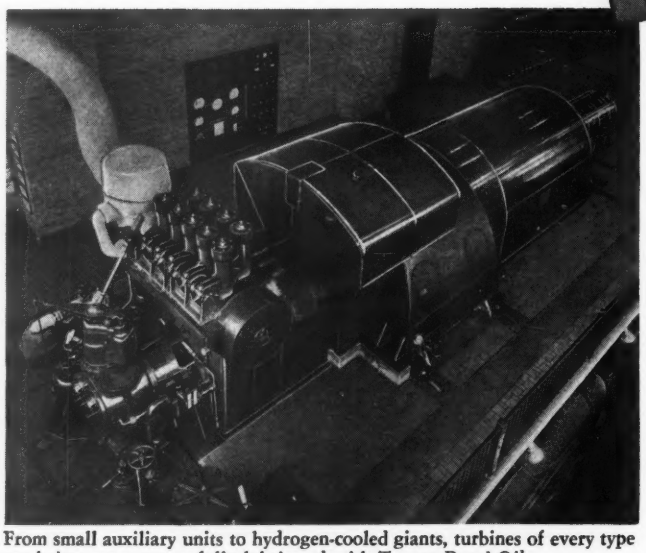
4 **CHECK G.E. for warehouse stocks.** A supply of many standard motors is kept on hand to meet urgent war needs. Perhaps the motor you want, or can use with a few simple changes, is available for immediate shipment.

AND REMEMBER—keep the motors you have in top-notch shape. General Electric Company, Schenectady, N. Y.

General Electric and its employees are proud of the Navy award of Excellence made to its Erie Works for the manufacture of naval ordnance.

GENERAL ELECTRIC





From small auxiliary units to hydrogen-cooled giants, turbines of every type are being more successfully lubricated with *Texaco Regal Oils*.

THEY PREFER TEXACO

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

Despite the increasing fluctuations of war-time power loads, your turbine governors will respond instantly, assure "straight-line" speed graphs, when you use *Texaco Regal Oils*.

Texaco Regal Oils separate rapidly from air and water, are highly resistant to oxidation, emulsification, gum formation and sludging. They keep lubricating systems clean, maintain normal bearing temperatures, insure smooth, sensitive governor action.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent turbine operators everywhere.

These Texaco users enjoy many benefits that can also be yours. A Texaco Lubrication Engineer will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distribution points in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

FOR YOUR ENJOYMENT
FRED ALLEN every Sunday night. See your local newspaper for time and station.

Care for your Car ..for your Country

TEXACO REG. T. M.

TEXACO Regal Oils
FOR ALL TURBINES

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

POWER PLANT ENGINEERING

JUNE, 1942

VOLUME 46, No. 6

Cover: The illustration shows a turbine room operator opening throttle controlling steam flow to one of the units. Photo, Duquesne Light Company.

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Leading Pharmaceutical Plant Finds

YARWAY TRAPS Step Up *Manufacturing Efficiency* . . . .

DRAINING processing kettles and other steam-heated equipment at the Hoffmann-La Roche, Inc., plant illustrated above —many Yarway Impulse Traps are contributing their share toward the most modern manufacturing efficiency.

The performance of Yarway Traps in *handling condensate from peak loads to practically nothing*—plus the fact that they are so *easily installed* and give such *trouble-free service*, have made them the choice of thousands of Trap users who have purchased more than 130,000 Yarway Traps to date.

Have you investigated this trap that *gets equipment hotter, sooner—saves fuel—saves space*—that is *easier and cheaper to install*—that *costs less to buy than to repair many other type traps?*

Ask your Mill Supply Dealer or write for Catalog T-1736.

YARNALL-WARING COMPANY, 114 Mermaid Avenue, Philadelphia

YARWAY IMPULSE STEAM TRAP

WHAT LEADERS SAY

You and Business Papers Can Help

By JOHN H. MORSE

SHOULD advertising be carried on during the war? We think that it should, but, we also believe that advertising should be planned to contribute to the war effort. Nothing that we may wish to do, absolutely nothing, must be allowed to interfere with the winning of the war. Fortunately, advertising can contribute to the war effort in many ways and need not permit itself to be classed as a wartime non-essential. One of two major jobs that advertising can shoulder at this time is providing information to those fighting on the home front and in the production armies—information which will help them in every possible way to increase the production of fighting tools, and the efficient use of products for civilian needs. This includes news of better ways of using machinery, of time-saving methods that can be widely adopted, of labor-saving made possible by new attachments or new operating tricks. You and your trade papers, can dig up scores of pieces of worthwhile helpful information, which the readers will be grateful to you for passing along. It may well prove that doing this job successfully will call for the use of more and larger space in the trade press than you would use in a selling type of campaign. It is a type of advertising that specializes in long copy—long enough to tell the whole story.

Other opportunities to use informative advertising will appear as the war progresses. For example, we are nearing the time when a vast increase in the number of women workers in industry must be accomplished. Manufacturers of equipment can anticipate this and develop training plans or new gadgets needed to aid women in using heavy machinery effectively. There is also much to be done on developing alternative products—for present alternative products—and to pass the word along for requests for lists of alternative products come to the Bureau in ever-increasing volume.

Then there is another field in which advertising, skillfully handled, can contribute to the war effort. You read and hear much about this being a war of machines, a battle between production lines. That is only a part of the picture. This war will be won and lost just where all other wars have been won or lost, in the minds of men and women. There is a big job in keeping hope and courage and determination blazing in the minds of those on the production lines and in the minds of those behind the production lines.

Much of this can be done by the informative material which you supply. . . . Much of this can be done by telling the story of the growing might of industry in war production without giving aid to the enemy, in fact adding to his discomfort. Such a story can be told until the people feel the surge of rising confidence.

And there is much to be done through the tone and spirit which you get into your illustrations and copy. More "Damn the torpedoes"—the old, sturdy American aggressiveness — of attacking, not defense, of daring, not of security, not waiting. More of the old spirit which asked only for security of opportunity—no man wants more, no one should settle for less.

English general advertising has been particularly characterized by a humorous zest, a light thumbing of the nose at hardship and danger, which must give a lift to the spirits of the reader and leave him with a very friendly feeling toward the firm whose products are thus advertised—or whose name is thus freshly fixed in the reader's memory. We can afford to have much more of that type of advertising, instead of heavy prestige or institutional copy. The "we've got to do without" conservation type of copy can also be brightened by a light touch . . . and that touch can be added now that war has ended, at least temporarily and we hope permanently, the breathless, excited accent on immediate sales.

There is still another job for advertising to do during the duration while the shelves or the showrooms are empty of your goods. We hear talk of deferred demand that is going to leap out of the brush as soon as the cannons cease. One trouble with deferred demand, as far as we have been able to measure it, seems to be that when it is deferred too long, it dies. People's habits change. They forget how much they desired many things. They become rooted in different ways of life.

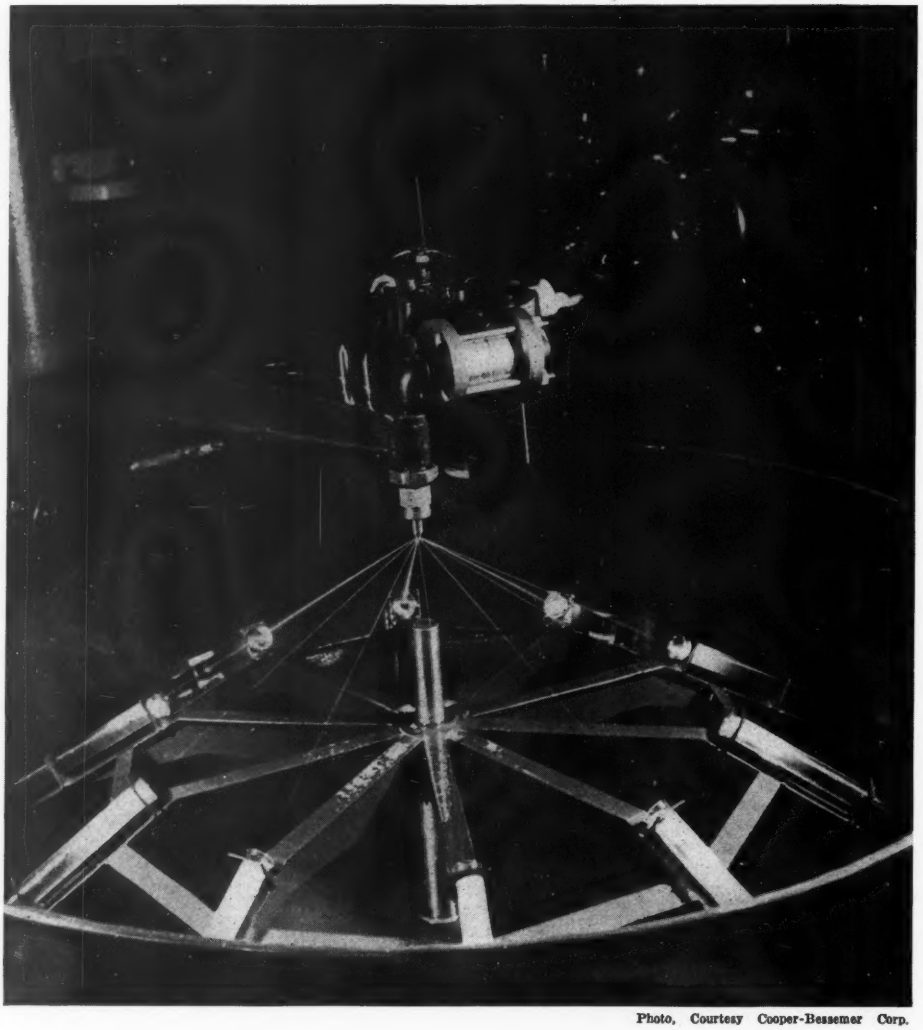
Advertising can keep the spark of life in that deferred demand . . . keep it flickering gently until that day when the United States returns, not to normal demand but to our usual stimulated demand. We did not build our standard of living on the normal demands of human beings, no one here has ever operated in a normal market, we have had a stimulated demand economy throughout our lifetimes. Advertising has been the great stimulator, and now is no time, in our estimation, to shut off the spark that energizes America.

As the war economy matures, as more of our current life becomes channeled into a definite part in the winning of the war, there will be time to look ahead and explore these possibilities. This may have much to do with establishing advertising policies which will speed up the process of converting the United States to post-war plenty, by telling and selling the public of the real part played by business . . . just as advertising in the past has speeded up the distribution of products throughout our national economy.

JOHN H. MORSE, chief of the Division of Commercial and Economic Information, Bureau of Foreign and Domestic Commerce, U. S. Department of Commerce, spoke before the Marketing Conference of the American Management Association in New York on March 5 and definitely "tied the can" to the rumor that the Federal Government is opposed to advertising as such.

Mr. Morse's talk, although greatly shortened here, clearly indicates that the Department of Commerce recognizes the essential role of the right kind of advertising as an aid to winning the Battle of Production. The "right kind" must be planned; it must tell you how to do something better; emphasize progress; lighten the burdens of war; and keep alive for a better day the American spirit of progress.

Mr. Morse joined the Bureau of Foreign and Domestic Commerce in January, 1941, after a career that included military service in the last war, teaching economics, business administration and sociology at two universities, and 16 yr. service with the Buchen Co. of Chicago.



Photo, Courtesy Cooper-Bessemer Corp.

Testing Diesel Fuel Nozzles

THE methods and techniques of testing equipment in modern industry are always interesting. Here, in this photograph, for example is an arrangement used in the plant of The Cooper-Bessemer Corp. at Mt. Vernon, Ohio, for testing their Diesel engine fuel spray nozzles for the degree of angularity of the spray holes and their bore. The white lines radiating from the tip of the nozzle look like strings, but actually they are streams of fuel oil. The spray nozzle is fitted into the overhanging arm and fuel under pressure forced into it. As the resulting streams of fuel oil issue from the passages in the spray tip, they must strike the mouths of the test tubes accurately and deliver the proper amount of fuel oil or the tip is rejected. It is simple, but the accuracy with which the holes are drilled is intriguing. The reason for this test is, of course, quite obvious. The amount of fuel sprayed into the cylinder, the direction of spray and a definite amount of oil reaching all parts of the Diesel engine cylinder is very important

WITH THE EDITORS

◆ **THIS IS AN ORDER** . . . One of the orders of nation wide application which may affect every producer and user of electric power in the country has been issued by the War Production Board and sets up machinery to handle power shortages wherever and whenever they occur in this country. The reason given for this order is that in some areas shortages of electric power have already occurred and in others further shortages are threatened. It is stated that these shortages are generally caused by the vast increase in use of electric power by war industries, causing many systems to use their reserves in current operations, and reduce their margin in the event of breakdown, drought, fuel shortages, or other unfavorable conditions.

Two lines of action are set out in the order. The first requires utilities to operate their systems in a way that will produce the maximum amount of power from their present capacity and in general calls for interconnection and exchange of power from all power producing sources. The second part of the program establishes machinery for mandatory curtailment of power for commercial and industrial as well as residential consumers.

This is the most far-reaching order that the Government has ever issued concerning the physical operation of power plants and their connecting systems. It demands a pooling of power among all power plants, utilities as well as non-utility plants, which many power engineers have long advocated but have never been able to put into effect except to an extremely limited extent, principally because of failure to agree on rates for interchanged power. Now that practice is mandatory by a Government order which throws innumerable problems in the lap of power producers to be worked out during war conditions.

For example, each utility is ordered to make an investigation of the type, amount and availability of any electric power generating facilities (with rated capacities of 100 kw. or more) owned by any non-utility power producer located in its operating area whether or not interconnected with such utility, and make such arrangements (including arrangements for interconnection where feasible) to accomplish said purpose as can be made by means of voluntary agreement among the parties.

On the consumers' side, the order places in the hands of the Director of Industry Operations the duty, when power shortage develops, to define the power shortage area and issue specific directions to utilities, non-utility power producers and consumers to relieve the shortage. He will then establish emergency curtailment schedules.

◆ **CHALLENGE TO POWER PRODUCERS** . . . Our war industries, which today means nearly all industries, require power to carry on. The problem of the power industry is to supply that power as the need arises regardless of the source, whether it be generated from fuel or falling water. Economy of production and long time planning, while recognized as extremely desirable under peace time conditions, are problems that must not be allowed to delay the production and installation of power generating equipment.

The term power industry is used here in the broad sense, not being confined to the utilities alone for the complete problem of supplying power for this country puts heavy responsibilities upon such elements of society as manufacturers of power equipment, consulting, designing and operating engineers, managers of factories and institutions that make extensive use of power.

◆ **UTILITIES GET FIRST CONSIDERATION** . . . In times like these, a reliable source of power is the principal essential, and the planners of factories for the production of war products must confront the problem of power supply as one having several answers.

It has been perfectly natural for the large war industries to turn to the public utilities for their electric supply. To the extent that utility plants have or can arrange to have the capacity to supply this power without impairing service to their already established customers, this source of power meets the emergency condition in a very satisfactory manner.

When, however, extensive additions to power plants are required in order to carry a load that is distinctly a wartime load that cannot be depended upon to last through the amortization period necessary to pay for the improvements, financial complications arise that warrant consideration of other power sources.

During peace times, many factories have built their own power plants and found them not only reliable in service but economical in operation. These same advantages are present in war times and the advisability of installing power generating equipment in new factories in locations where utility power is likely to be limited needs careful consideration at the time the factory is being built.

◆ **POWER LOAD CURVE** . . . A study of the curve showing the average daily production of electric energy for public consumption as prepared by the Federal Power Commission indicates a seasonal falling off since the first of the year, which is evidence that, for the present rates of industrial production over the country as a whole, existing power generating equipment is meeting requirements. In other words, existing power plants have produced more power than they are doing at this date. Where shortage of power is likely to occur is in entirely new factories or those being expanded, in strictly war industries speedily developed and designed to use outside power from a utility that has not had the opportunity to prepare for an unusual expansion in load.

Electric power utilities have grown up in this country principally to serve users of small amounts of electricity or those who have little or no use for exhaust steam. In large industries where heat is required, distinct advantages are possessed by factory power plants, a fact well known to power engineers.

If other conditions are such as to dictate a certain location for a war production plant where adequate public electric power is not available, this condition can readily be met by a factory plant, as it has been done in innumerable privately owned establishments.

Nearly all factories built for the specific purpose of producing war materials require a sizable boiler plant. The added difficulty of installing electric generating equipment should not be prohibitive.

◆ **MASS PRODUCTION WOULD HELP** . . . Time required to manufacture power generating units for an individual factory is no greater than that required to make equipment of like capacity for the utility plant.

Units of the type and sizes used in factory plants are fairly well standardized and with some planning these units could be produced along mass production lines to meet the requirements not only of factories but of navy vessels which are being built in great numbers.

Power rationing will help temporarily to enable war production factories to secure electric power, as will the recent order of the War Production Board stopping production of hundreds of manufactured articles made of iron and steel for certain civilian purposes, but if the power situation is so acute as to require drastic orders of this sort from the Government, the situation can only grow worse as long as war production is increasing, unless measures are taken to speed up the manufacture and installation of power generating equipment to the point where it is in step with added power requirements. Time being a controlling factor, preference as to the types of units should be given where possible to those that can most quickly be manufactured and put into operation, but the manufacturing facilities for all types of units should be utilized to the fullest extent and their products permitted to go into power generating plants in those areas where shortage is likely to occur.

POWER FOR A SINGLE-

Difficult power problem imposed by single-machine paper mill successfully met by the use of an extraction condensing turbine at the Herring, N. Y. mill of the St. Regis Paper Co. Non-condensing turbine unit installed in 1937 rebuilt in 1940 into a tandem compound, extraction-condensing unit. Another feature of this plant is a new electronic control type of direct-current paper machine drive, one of few of this type of paper machine drive installed in this country

IN FEW INDUSTRIES are the problems of power supply and industrial processes so interrelated as in a paper mill. The process of making paper is one that involves large quantities of steam at varying pressures as well as water and considerable amounts of electrical energy, but the relative proportions of these commodities vary with different types and sizes of paper mills. The conditions for a one machine mill, for example, will be quite different from mills having two or more paper machines. Conditions will also vary between mills manufacturing different types of paper.

The St. Regis paper mill at Herring, New York, which is to he considered in this article is a mill of the one-machine type, that is, it is a small mill having only one paper machine. In general, a one-machine mill is not very well adapted for operation in conjunction with a private power plant because of the difference between the steam and electrical demands throughout the day. Steam is required for heating buildings as well as for drying rolls on the paper machine and electricity is needed not only for the motors for driving the paper machine but for lighting and for driving equipment in the machine shop and other parts of the mill. It will be quite obvious that under these conditions the steam and electrical loads are not synchronized to any considerable degree.

Non-condensing Turbine Installed in 1937

In a plant of this kind, boilers are of course, a necessity whether electric power is purchased or generated. At the Herring mill, there were four old hand-fired boilers. These produced all the steam required and all electricity needed was purchased from the local public utility company.

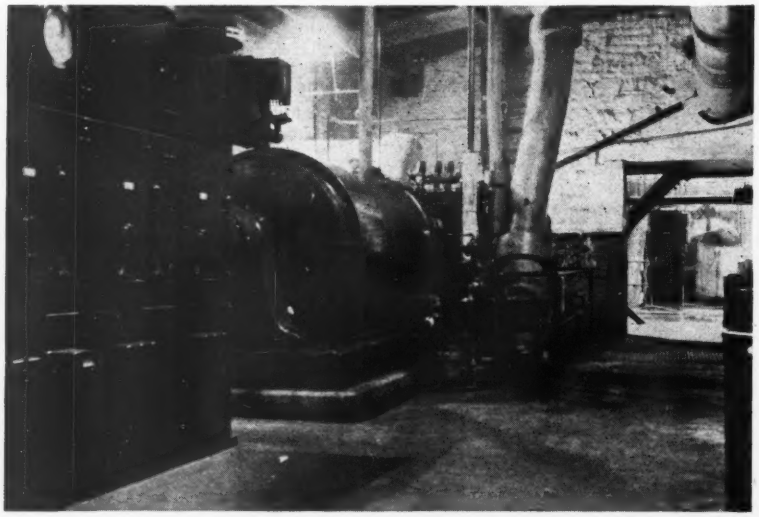


Fig. 1. A view of the rebuilt turbine-generator set at the Herring plant of the St. Regis Paper Co.

Some 6 yr. ago, it became necessary to make some changes. The boilers were approaching the limit of their period of usefulness and so plans were made to replace them with a new unit. At this time preliminary studies indicated that it might prove expedient, certainly desirable, to generate a small amount of electric power. By the use of a medium high-pressure boiler and a back-pressure turbine, a certain amount of low-pressure process steam would be made available and the electrical energy produced would represent a more or less clear saving.

After these preliminary studies, Burns and Roe, Inc., New York consulting engineers were retained to work out detailed plans and in December, 1936, a straight, non-condensing geared turbine alternator unit with back-pressure governor was purchased, together with a 25,000 lb. per hr., 350 psi pressure boiler. The turbine was a De Laval unit and the boiler a Combustion Engineering Co. unit.

The turbine unit was built for a normal rating of 800 kw. at 80 per cent power factor with steam conditions of 325 psi ga., 700 deg. F. and 10 psi exhaust pressure. The turbine was so nozzled that the unit could develop 938 k-va. at higher power factor, the generator being an Allis-Chalmers Co., 1000 kv-a., 600 v., 3-ph., 60 cycle alternator with a direct-connected, 125 v. exciter. The turbine operated at 6980 r.p.m. while the generator speed was 1200 r.p.m.

No new buildings were involved in making this installation. The turbine was installed in a room in one of the mill buildings together with the electrical switchboard and space was cleared in the existing boiler room to accommodate the new boiler. The new boiler, of course, despite the fact that it was

MACHINE PAPER MILL

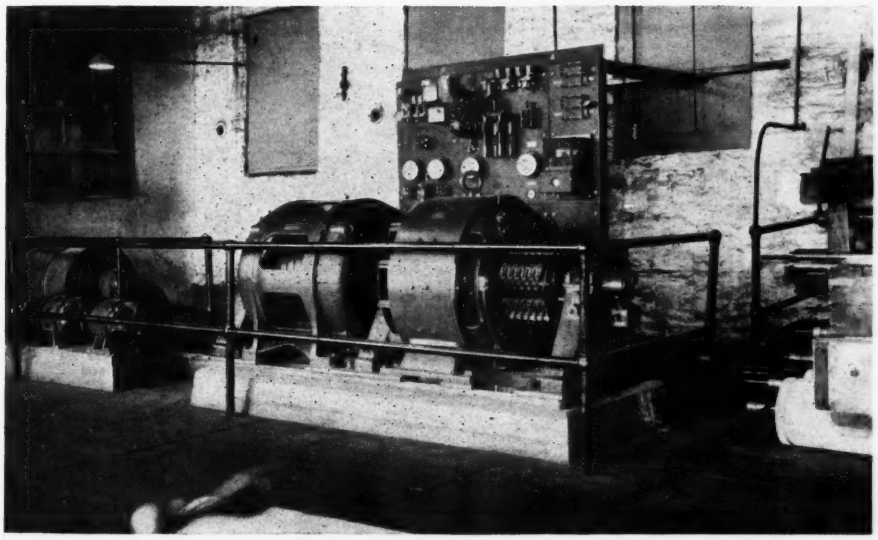


Fig. 2. The electron tube-controlled direct-current paper machine drive installed at the Herring plant is one of the few of its kind in existence. This view shows the control panel and the synchronous motor generator set. The exciters for this unit and the ventilating fan for the main d.c. motor are at the left

an integral furnace unit, was considerably larger than the old units and clearances were very small, so small that it is almost impossible to get a photograph of the unit.

The boiler is a two-drum, bent tube unit with drums of fusion welded construction with the baffles arranged for 3-pass, cross flow and with the gas outlet at the upper rear of the boiler. The baffles are of monolithic tile construction. An Elesco superheater forms part of the unit and was designed to raise the total steam temperature to 700 deg. F. when delivering steam at a pressure of 335 psi at a rate of 20,000 lb. per hr. The unit is fired by pulverized coal.

Turbine Rebuilt in 1940

This installation, that is the new boiler and the back pressure turbine generator, was operated under the designed conditions from August, 1937, 1940, at which time the turbine and reducing gear were returned to the De Laval works at Trenton for conversion into a tandem-compound, condensing, single extraction unit.

For several months preceding the decision to modify the unit, it had become apparent that mill conditions had become sufficiently different to warrant changing over from straight non-condensing operation. During this time the demand for 10 lb. steam had become so low that the average load carried by the machine became only slightly higher than 200 kw.

With an average load demand of around 1000 kw., the yearly bill for purchased power had mounted to almost $20,000. These conditions, obviously, merited further studies of the power problem. It was felt at that time, and the feeling has since been confirmed by actual operating results, that the solution to the problem could be achieved by the addition of a condensing element to the outboard end of the original non-condensing turbine and at the same time, complete the interconnecting piping and adding proper control valves so that the steam and load demands could be met independently up to the full capacity of the unit. In other words, what was desired was an arrangement which would at all times enable the electric generator to carry its full rated load while the steam supply to the mill would adjust itself in accordance with the demands of the mill.

Views of the modified unit are shown in the accompanying photographs and the constructional details in the line drawings. The change resulted in a rather unusual arrangement consisting of a high and low-pressure element with the high-pressure element between the low-pressure unit and the generator.

The new, condensing element was designed for 10 psi ga., 400 deg. F. and 28 in. vacuum. The rating of the combined unit was then made such that 800 kw. at 80 per cent power factor could be generated while operating non-bleeding, and 938 kw. at higher power factor can be delivered while extracting from cross-over piping.

The final arrangement of the units are shown in Figs. 1, 3 and 7. In the piping connecting the exhaust of the original non-condensing turbine to the inlet of the added condensing turbine will be seen a double valve arrangement, Fig. 4. One of these valves controls the admission of the steam to the low-pressure turbine to maintain, normally, a constant pressure of bled steam at 10 lb. ga.

Under certain conditions, of steam and electrical load demand, however, it is necessary that the pressure in the cross-over piping and at the low-pressure turbine inlet rise above 10 lb. pressure. Under such conditions the second valve of the combination valve arrangement comes into play. At this time when the bleeder pressure control valve has opened wide and

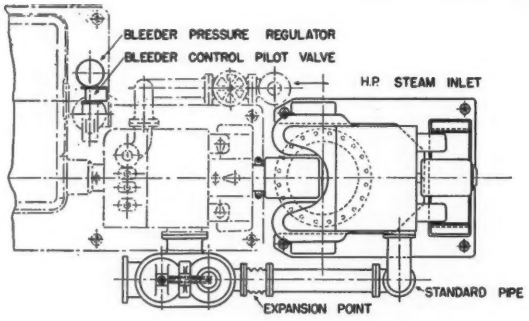
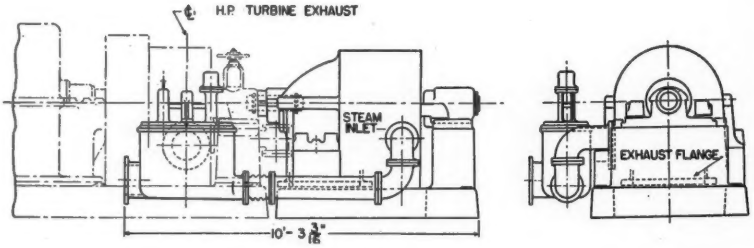


Fig. 3 (Left). Details of the rebuilt turbine showing how the condensing element was added on to the outboard end of the high-pressure element



tends to over travel, the second valve to which it is interconnected starts to close, thus acting as a pressure reducing valve to maintain the desired 10 lb. pressure in the low-pressure process line. As will be noted, the two valves are interconnected by means of a floating link.

While mention has been made of the normal bleeding pressure of 10 psi ga., arrangements are incorporated in the pressure control so that the pressure can be varied from 5 lb. ga. to 27 lb. ga. when necessary. The bleeder pressure control device is motor-operated so that adjustments of the bleeder pressure within this pressure range can be made from a point remote from the turbine-generator used.

Load Limit Regulator Added

Shortly after the tandem-compound unit was put in operation it appeared desirable to install a load limit regulator. This was done and an electrically operated load control device was mounted on a panel adjacent to the main switchboard to operate in conjunction with the turbine motor synchronizing device so that any predetermined load within the limits of the unit's capacity, could be used and maintained. A view of this device is shown in Fig. 6. It is an Allis-Chalmers impulse type regulator and it controls the operation of a small electric motor directly on the high pressure turbine governor mechanism. The operation of this device has proved very satisfactory. It enables the maximum possible use to be made of the generator at all times.

This turbine-generator arrangement is without question the outstanding feature of interest at this plant. Like many others of its kind, this plant is not a show plant. The consequence of a period of growth over many years, it is 100 per cent utilitarian—there are no decorative frills. It is well operated, however, and the management takes considerable and justifiable pride in the installation. The saving in the power bill has well justified the investment and effort involved in solving the power problem at this mill.

The power factor of the electrical system is maintained at unity by means of a large 2200 v. synchronous motor operating as a synchronous condenser, that is, it carries no mechanical load. This unit is installed in a room together with the demand meters, adjacent to the turbine generator. Of course, as will be evident, the generator is unable to supply all the electrical load needed at this mill; a considerable amount is still purchased from the Central New York Power Corporation which serves this part of N. Y. State.

The rebuilding of the turbine in 1940, of course, made necessary the installation of a condenser. While the machine was at the factory, therefore, a room was constructed underneath the turbine location and a surface condenser installed. This room also houses the circulating and condensate pump.

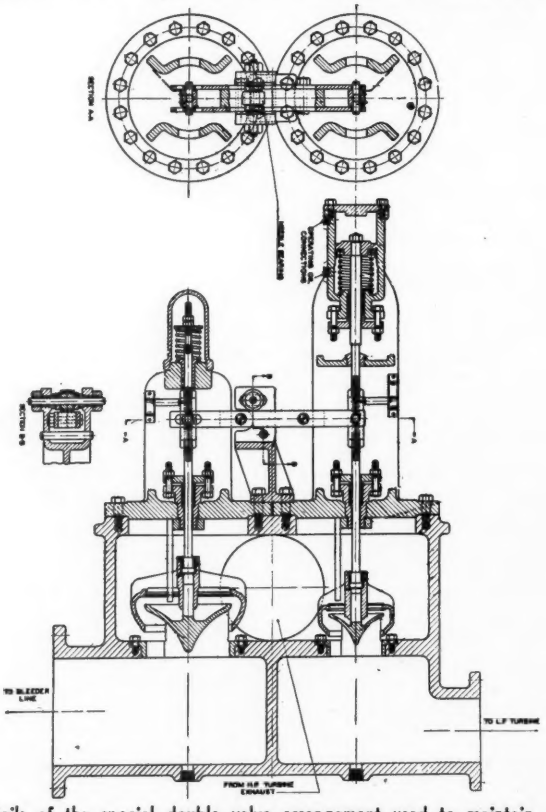


Fig. 4. Details of the special double valve arrangement used to maintain, normally, a constant pressure of bled steam

While the boiler installation has already been mentioned a few details may be of interest. As already stated, the unit is fired by pulverized coal. Coal is delivered from a storage bin by a screw conveyor to the bottom of a bucket elevator which in turn delivers the coal to an overhead bin feeding the pulverizer. The latter is a Raymond Impact mill with a capacity of 2400 lb. per hr. driven by a 40-hp. Westinghouse motor, manually controlled.

The boiler is provided with both forced and induced draft fans and an air heater. The latter is a Combustion Engineering Corp. vertical plate, counter flow type heater designed to heat the air to a temperature of 383 deg. F. with gas entering at 580 deg. and with the boiler delivering 20,000 lb. of steam per hr.

Both the forced and induced draft fans are American Blower fans driven by motors through hydraulic speed controllers. The forced draft fan is manually operated but the induced draft fan works on a Carrick control from the boiler steam pressure. The Carrick regulator operates the motor furnishing oil to the hydraulic coupling mechanism.

The boiler proper has 2660 sq. ft. of heating surface while the furnace wall totals 1115 sq. ft. The air heater surface is 1404 sq. ft. The boiler has a brick setting with a front wall 18 in. thick of 9 in. No. 1 firebrick backed with 9 in. of red brick. The side walls below the water wall heater are 18 in. thick, of 4½ in. No. 1 firebrick, 4½ in. of No. 2 firebrick and 9 in. of red brick. In the water wall region, the side walls consist of 9 in. No. 1 firebrick and 9 in. of red brick. The furnace floor is of 7 in. No. 2 firebrick laid over 6 in. of hollow tile.

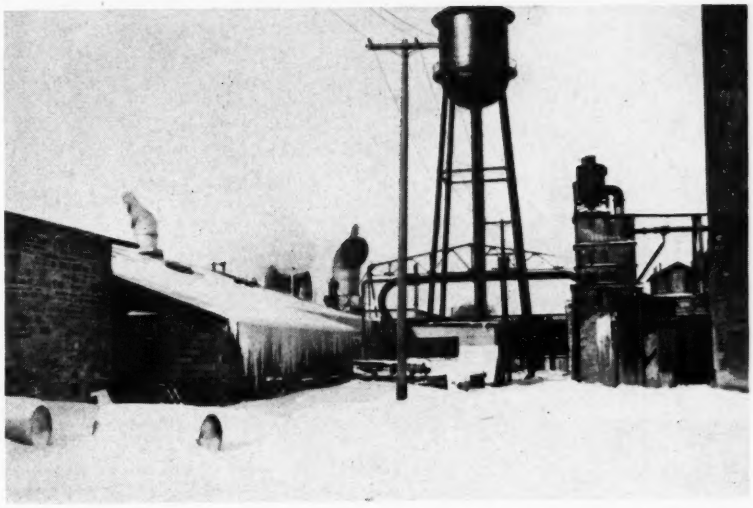


Fig. 5. Severe winter conditions at the St. Regis plant impose heavy steam heating loads

Electron Tube Controlled Paper Machine Drive

Aside from the turbine generator installation one of the most interesting features of the power system at the Herring mill is the Westinghouse paper machine drive. This is a d.c. motor drive involving beside, the main driving motor a motor generating set with separate exciters for synchronous driving motor and d.c. generator and an electronic type of control. A view of a portion of this drive is shown in Fig. 2. This picture shows the main motor generator set at the extreme right, the exciter units in the center and the motor driven ventilating fan for cooling the main driving motor (not shown as it is located 10 ft. below on the

PRINCIPAL EQUIPMENT IN THE HERRING, N. Y., PLANT OF THE ST. REGIS PAPER CO.

Type of plant.....Industrial
Owners.....St. Regis Paper Co.
Location.....Herring, N. Y.

Boiler Equipment

1 Combustion Engineering Corp., 2 drum, bent tube integral furnace boiler, designed for 35 lb. pressure 700 deg. F. and rated at 25,000 lb. of steam per hr. Heating surface in boiler, 2660 sq. ft., heating surface in furnace 1115 sq. ft.

1 "Elesco" superheater, manufactured by the Superheater Co. designed to raise total steam temperature to 700 deg. when the boiler is delivering steam at a pressure of 335 lb. per sq. in. at a rate of 20,000 lb. per hr. and with excess air corresponding to 15 per cent CO_2.

1 Combustion Engineering Corp. vertical plate type, counter flow, air heater. Total heating surface, 1404 sq. ft. Designed to heat air to a temperature of 357 deg. with air entering at 80 deg. and gas entering at 580 deg. and leaving at 383 deg. F.

Furnace, Combustion Engineering Corp. Integral furnace with tubes as follows:

1 front consisting of 12 3-in. tubes .....101 sq. ft.
1 roof consisting of 12 3-in. tubes .....153 sq. ft.
1 bottom consisting of 10 3-in. tubes .....125 sq. ft.
2 sides consisting of 52 3-in. tubes .....538 sq. ft.
Internal downtakes, 10 3-in. tubes ..... 99 sq. ft.

1115 sq. ft.

Burners, 2 C.E. type "R" forced draft burners provided with a portable oil torch for lighting up.
Pulverizer. Raymond Impact mill, motor driven 2400 lb. of coal per hr.
Safety valves. Crosby H2-2 with alloy seat.
Blow-off valves. Homestead, 2½-in.
Water columns. Yarway.
Soot blowers. Bayer soot blowers with Model "K-3" balanced valve in head. Complete system includes 5 elements with expansion wall sleeves, clamps, hangers and all necessary Vogt valves for operation at 700 deg. F. 335 lb. pressure.

Fans

Forced draft fan. 1 full housing, 12,000 c.f.m. type No. 4 American Blower Co. "Siroco" motor driven with hydraulic coupling.
Induced draft fan. 1 full housing, 1000 c.f.m. type No. 4½ American Blower Co. S.I.S.W. with hydraulic coupling.
Draft control. Carrick regulator.

Boiler Instruments

1 Ashcroft indicating steam gage.
1 Bailey boiler meter.
1 Bailey multi-pointer draft gage.
1 Ashton feedwater pressure gage.
1 Bailey flow meter.
1 Carrick control unit.

Turbine Generator

1 De Laval tandem compound condensing extraction unit. Normal rating 800 kw. 80 per cent power factor with steam conditions of 325 psi, 700 deg. F. and 10 lb. back pressure.
Generator, Allis-Chalmers.

Condensing Equipment

Surface condenser. Condenser Service & Engineering Co., 1362 sq. ft. single pass. Steam to condenser, 12,500 lb. per hr., Vacuum, 28 in. Hg. Circulating water, 2250 g.p.m., Cir. water temp., 80 F.
Condensate pump. De Laval type SM-P2½ in. S.H.P. Motor driven. Pump capacity, 30 g.p.m., at 115 ft. head. 2 in. inlet and 1½ in. discharge.
Circulating pump. Ingersoll-Rand, single-stage, double suction, split case centrifugal pump. 2250 g.p.m., cap. 55 ft. head. 86.1 per cent efficiency. Direct connected to 25-hp. 1150 r.p.m. motor.

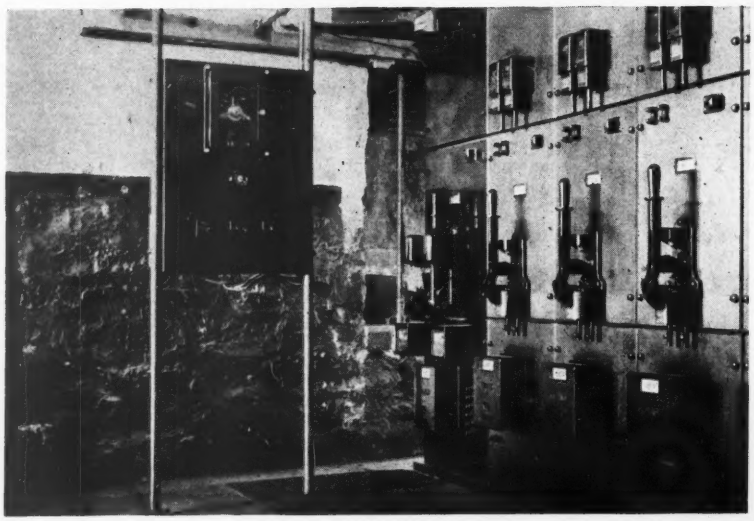
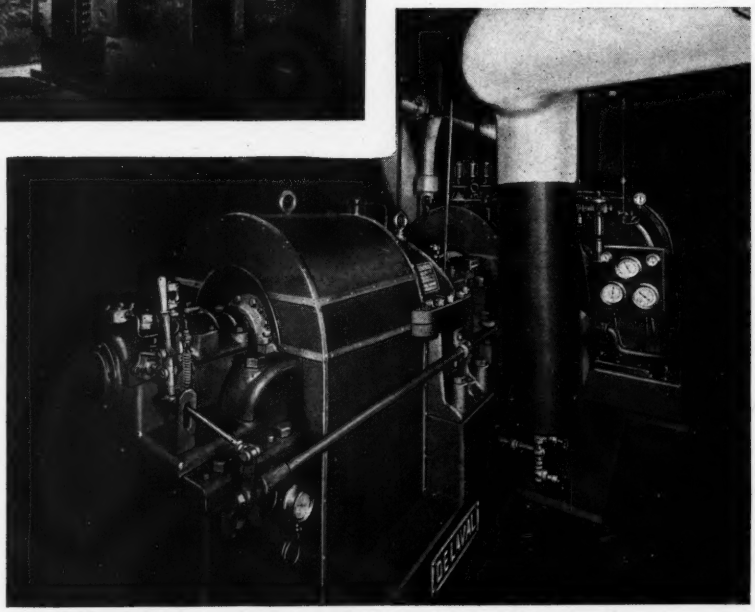


Fig. 6 (Left). On a separate panel adjacent to the main switchboard is mounted the load regulator which makes it possible to maintain any predetermined load

Fig. 7 (Below). A view of the steam end of the turbine unit showing the condensing element in the foreground



basement floor level) behind the exciters. The electron tube control panel is shown behind the motor generator set. The latter consists of a 296 hp., 550 v., 80 per cent power factor, 1200 r.p.m. synchronous motor direct connected to a 200 kw., 250 v., 800 amp., d.c. generator. The exciter unit consists of a 15-hp., 550-v. induction motor direct-connected to (1) a 2-kw., 250-v., d.c. generator for the synchronous motor, and (2) a 5-kw., 250-v., d.c. generator as exciter for the d.c. generator.

By means of this system of motors and motor-generators and its associated control equipment, the speed of the paper machine can be maintained constant to a very high degree of accuracy. It is one of the few of this type of drives in existence and it has been found highly satisfactory.

The power plant at the Herring mill of the St. Regis Paper Co. is operated under the general direction of P. J. Baron, the chief engineer. C. B. Martin, the vice-president of the company, takes an actual interest not only in the operation of the mill as a whole but in the power plant as well. Unlike many other industrial plants in this case the power plant is not regarded merely as a necessary evil; instead it is considered an integral and inseparable part of the process of making paper and it is for that reason that the power problem has been solved so effectively.

In concluding this description we wish to acknowledge our indebtedness to Mr. Martin, vice-president, and Mr. Baron, the chief engineer of this plant, for their courtesies and splendid co-operation during our visit to the plants.

BLACKOUTS ARE RISKY

EXPERIENCE in Europe indicates that blackouts may be almost as dangerous to civilians as enemy bombs, S. G. Hibben, Westinghouse director of applied lighting and blackout authority warned air-raid wardens and defense officials in discussing war-time safety measures at the annual convention of the Greater New York Safety Council.

Enough evidence is at hand to show that accidents to civilians in blackouts is one of America gravest safety problems. This is forcibly demonstrated by records in London for 1941 which reveal that over 10,000 civilians were killed or injured in blackout accidents alone.

An all-out blackout does not mean total blackness, even in London. In American cities for safety's sake, there must be as much light as possible without helping the enemy to find his objectives. Military considerations in the final analysis will determine the degree of blackout commensurate with civilian safety and the vital need to keep industrial production of war materials going at all costs. In some localities only a fraction of a footcandle of light, approximating starlight, may be permitted. In others, lighting levels may be raised to that of bright moonlight, or even to that found under peace-time conditions in residential areas.

Principles of visibility are essentially the same for vehicles, Mr. Hibben pointed out, suggesting white stripes around bodies or white fenders and bumpers. Small lights might be mounted beneath a chassis to shine downward, which would reveal a car or truck in silhouette. The reflector disks with which many automobiles are already equipped as standard equipment are valuable. Headlights should be dimmed, by means of some covering, to the brightness of moonlight. In an emergency, several layers of newspapers over the lights might suffice.

Quick-Starting STEAM TURBINE

BY C. H. S. TUPHOLME

BEFORE the interconnection of steam power stations under the Grid System, now in service in Britain, it was necessary in all stations to have some form of emergency power supply to auxiliaries for use when starting up or getting away again as soon as possible after a complete shut-down. In most cases this took the form of a small house-unit which could be started up on both the boiler and turbine sides without any auxiliary electrical power, and thus supply the power for essential auxiliaries to raise and maintain sufficient head of steam to run up one of the larger sets in the station.

In other cases one of the smaller sets in the station which might otherwise have been taken out was retained and adapted to serve as a house-set in emergency, as under such conditions its efficiency was not of great importance, and an old machine suitably modified served the purpose well. Such sets were generally started up non-condensing to supply essential auxiliaries, and later changed over to condensing operation when cooling water supplies became available.

With the interconnection of power stations, there was made available, under normal circumstances, an alternative or outside source of power for starting up auxiliaries even when the station had been completely shut down, and in most large stations it is now common practice to keep a proportion of the auxiliaries running from the outside supply. This reduces the possibilities of an unintentional shut-down, while if the station has to be started up from a complete shut-down, the external source of power makes this a simple matter.

The need for house-sets and emergency sets has, therefore, decreased very much in stations interconnected with other sources of supply, more especially as many stations can link up permanently, or reasonably quickly in case of need, with a second external supply. The occasion may arise where a total shut-down takes place in a station and, possibly as a result of the shut-down, no power is obtainable from any outside source. To start up a turbine set under such conditions means the raising of a head of steam in a boiler without any auxiliary power, and the running up on atmosphere, in most cases, of one of the smaller sets in the station to obtain sufficient power for the boiler fans and stokers, and the condenser pumps. While in the majority of stations containing a proportion of older, and as a rule small units, this is generally possible in order to put into service one of the larger units, the modern station with only large units is faced with the possibility of not being able with safety to start up from a total shut-down without an external power supply for auxiliaries. Such stations must accordingly have some form of emergency unit to take care of such a contingency.

The larger the station, the greater is the need for preventing an involuntary total shut-down, and if this should occur with a simultaneous removal of all outside sources of supply, still greater is the necessity for getting the plant back into service with the minimum loss of time. In the smaller stations, on the other hand, there is not the same necessity, relatively, for getting away again immediately and the longer time required to start up one of the small sets in the stations is generally not so serious

In Britain, the provision of special emergency units is confined mainly to the larger stations, to stations at one end of a long supply line, or to stations not interconnected with other stations.

High thermal efficiency not being of first importance, steam emergency units for the purposes outlined are generally designed for exhausting to atmosphere in order to obtain quick starting. In some cases the control is so arranged that the unit is run up to speed automatically on failure of the main supply to the auxiliaries on the boilers and turbines, or as in the majority of cases, the unit is arranged to be started up by means of remote control from the main control room or from any other suitable control point. Equally, oil engine driven units can be arranged for emergency use in a similar manner, and a number of both types have been installed in large power stations.

Features of Quick-Starting Units

Recently the English Electric Co. has completed the manufacture and testing of a 500-kw. emergency quick-starting unit for a large power station where there is no interconnection with external sources of supply. Although this station contains a number of comparatively small turbine sets, one of which in emergency could have been started up without power for its auxiliaries, the time which this operation would have required in the event of a total shut-down might have had serious consequences in the process plant associated with the station. For this reason it was essential to reduce to the minimum the period of any inadvertent total shut-down, and the new 500-kw. emergency unit has been designed especially for entirely automatic operation by remote control, and for running up to full speed in the shortest possible time.

The turbine, of the impulse type, is designed to take steam at a pressure up to 200 psi. and 750 deg. F. total temperature, and runs at a speed of 6000 r.p.m. driving the alternator, through reduction gearing, at a speed of 1500 r.p.m. The alternator, of the salient pole type, is designed for a 3-phase, 50-cycle supply, and is complete with exciter mounted overhung on the extended alternator shaft. A flexible coupling is provided between turbine and gear pinion, but the alternator rotor is solidly coupled to the slow-speed gear wheel, the weight of the rotor being of the impulse type, with only one velocity compounded stage, large blade clearances can be allowed without undue sacrifice of efficiency and, with all high steam pressure and temperatures confined to the nozzle belt before the main nozzles, the unit is particularly suited for quick starting without distortion of the turbine casing and consequent misalinement troubles.

The turbine shaft glands, of the labyrinth type in which there are no rubbing parts, are fitted with a small steam jet ejector which comes into operation automatically on the

main steam valves opening. The ejector withdraws the leakage steam from the glands and discharges to the turbine exhaust branch, thus avoiding any leakage of gland steam into the engine-room. Apart, therefore, from the closing of drain valves once the turbine is up to normal temperature and the routine inspection of bearing temperatures, the unit requires no special attention in service.

Starting is effected by remote control from a special panel in the main control room. The small amount of auxiliary power required for starting is provided from the station storage battery system, but in the unlikely event of even this supply being unavailable, the unit can still be started up by hand from the turbine platform by using the steam-driven auxiliary oil pump provided to cover such a contingency.

The complete control system is shown diagrammatically in Fig. 1 from which it will be noted that control of the various sequences of operations is effected by oil under pressure supplied, in normal circumstances, from a motor-driven oil pump on starting up, and maintained, when the unit is up to speed, by the main gear oil pump driven from the turbine shaft. The panel in the main control room contains, in addition to an electrical speed indicator actuated from a tachometer generator on the turbine, the starting switch for the motor-driven oil pump, with three positions marked "hand", "off" and "auto", and a red and a green signal lamp.

On starting, the main steam and cooling water isolating valves on the set being always open, the motor switch is turned to the "hand" position. The pump starts up, the red signal lamp lights up and as soon as the oil pressure has built up sufficiently high, the pressure commences to lift the oil-pressure controlled emergency stop valve and the main throttle valve controlling the supply of steam to the turbine. At the same time the oil pressure opens an oil-pressure controlled water-admission valve to the oil cooler. The turbine begins to turn as soon as the steam emergency and throttle valves leave their seats and full speed is reached within about half a minute from the motor-driven oil pump starting up. When full speed has been attained the turbine governor takes control and maintains the speed constant. The speed of the set, should it be necessary, can be adjusted by remote control of the governor speeder-motor, and in the same way the unit can be paralleled with any supply available later.

When the turbine is running steadily under the control of the governor, the switch of the motor-driven pump is turned through the "off" position to "auto", when, provided the main gear oil pump driven from the turbine is functioning properly, the motor-driven pump shuts down, the red signal lamp is extinguished, and the green lamp lights up. The motor-driven oil pump is then in a position to start up automatically should the relay oil pressure fall below normal.

In normal circumstances, the steam-driven oil pump, provided as standby, is isolated from the main steam supply and therefore inoperative, but, with hand control, it can be used for starting and when stopping the set, should the motor-driven oil pump be out of service or fail to function when required.

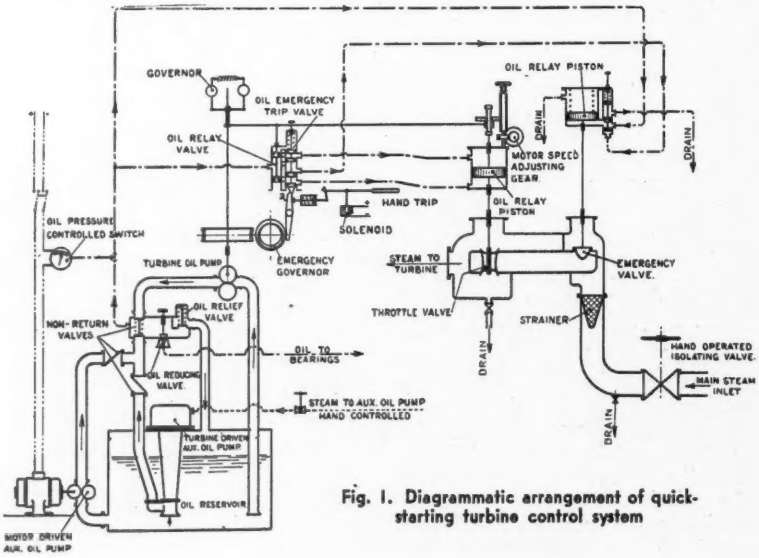


Fig. 1. Diagrammatic arrangement of quick-starting turbine control system

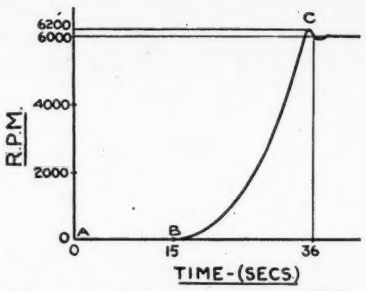


Fig. 2. Speed-time curve on starting 500-kw. emergency turbo-alternator set. A, motor driven oil pump started up. B, main steam control valves begin to open. C, main turbine governor takes over speed control

For shutting down the set from the control panel, a "stop" button is provided which causes a solenoid fitted to the turbine emergency trip to be energized and thus trip the set. Equally the emergency trip can be operated by hand from the turbine platform.

Before shipment from the factory the set with its control equipment, oil pumps, etc., was erected and tested under its designed steam conditions, and numerous tests of starting up periods have been averaged in the curve shown in Fig. 2. From the moment of starting the motor-driven oil pump, about 15 sec. was required for the pump to generate sufficient pressure to open the main steam control valves, and the unit was up to speed and under the control of the turbine governor within the remarkably short time of 36 sec. Even under such onerous starting conditions, the balance and running of the set was very satisfactory.

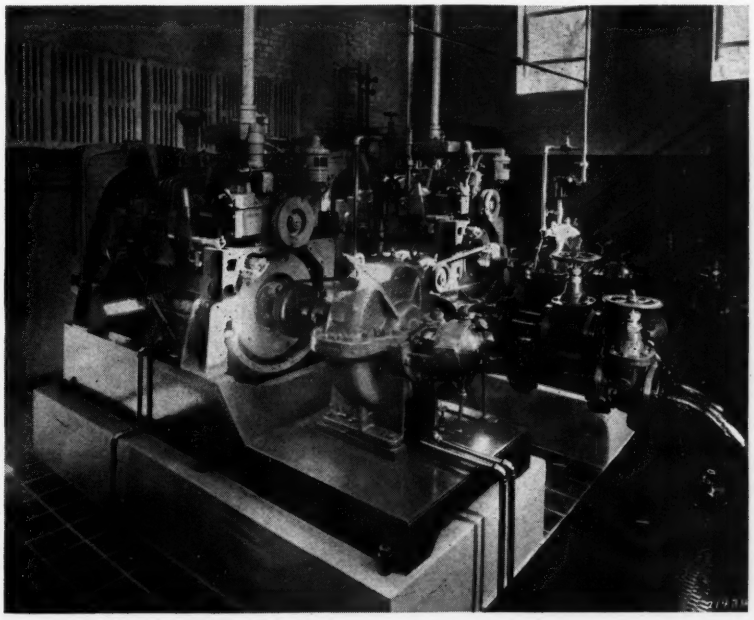
The provision of such quick-starting emergency units in large stations is well justified under peace-time conditions, but under the more exacting conditions of today, their value cannot be overemphasized.

A New England power company saved $80,000 last fall because it had in its maintenance stock a spare stator for a generator. The 24-yr. old generator was restored to service in 12 da. by workmen from the Boston District Mfg. and Repair Dept. of Westinghouse. Without the extra stator on hand, it would have taken at least 8 da. more to put the machine back in operation, and would have cost $10,000 a day for electricity to replace the output of the generator under repair.

Diesel Pumping Plant At Buzzard's Bay

Intermittent operating requirements in isolated pumping plant satisfactorily met by high-speed Diesel engine drives. Direct connected pumping units also belted to electric generators which deliver their output to storage batteries supplying power for light and electrically operated auxiliaries

By FRANCIS A. WESTBROOK



WHEN the pumping station for the Buzzard's Bay Water District, near the southern end of the Cape Cod Canal, was installed it was decided to make use of Diesel power. This was because it was found to be the most economical source of power. Other conditions influencing the character of this installation are that since this is pretty much of a summer colony, the hours of pump operation are no more than 6 to 8 every other day in winter and 6 or 7 hr. per day, 6 days per week, in summer. In other words the water requirements are not very great, but of course assurance of an adequate supply under all foreseeable conditions, and at all times, is essential.

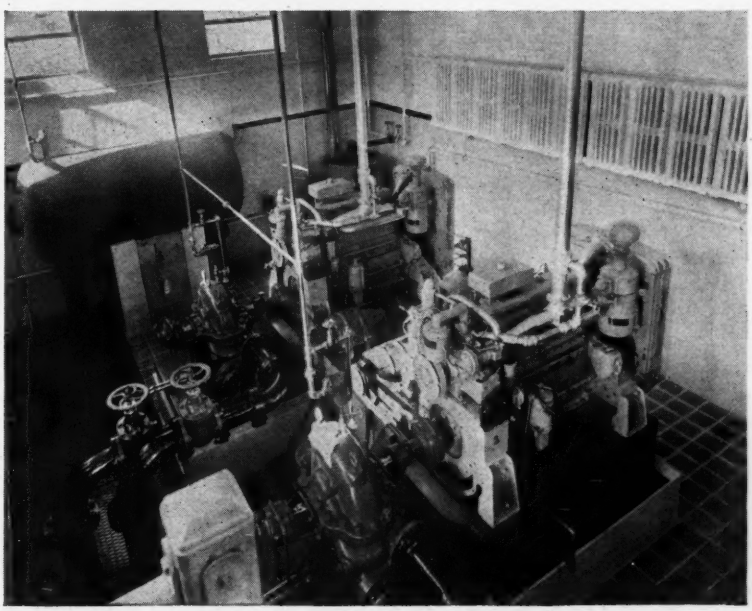
For such intermittent operation it was decided that the installation of the high speed type of heavy duty Diesel engine, direct-connected to the pump, would be preferable to the slow speed type of engine designed primarily for continuous operation. In order to provide for an assured water supply two entirely separate pumping units were installed, each capable of handling more than the requirements.

The photographs show the very neat and compact building constructed for the pumping station and the equipment installed in it. Because it is a completely isolated plant each unit is belted to a 2-kw. direct current generator which charges a bank of storage batteries. This drives the electrically powered auxiliaries such as vacuum pumps, the oil-burner for heating the building in winter, electric lights, etc. The vacuum pumps for priming are from the Nash Engineering Co., and there is also a gas engine-driven Nash vacuum pump for use in case of extreme necessity. The generators are located between the units, as shown clearly in one of the photographs.

The installation consists of two 30-hp. Caterpillar 1200 r.p.m. Diesel engines. They are direct-connected to two 2-stage Worthington centrifugal pumps rated at 300 g.p.m. As already stated each engine is belted to a 2-kw. direct cur-

Fig. 1. (Left) A general view of the two Diesel engine driven pumping units at the Buzzard's Bay Water District Pumping Plant

Fig. 2. (Below) Another view looking down on the engines and pumps showing the method of connecting the electric generators. These are located between the pumping units and connected by V-belt drives



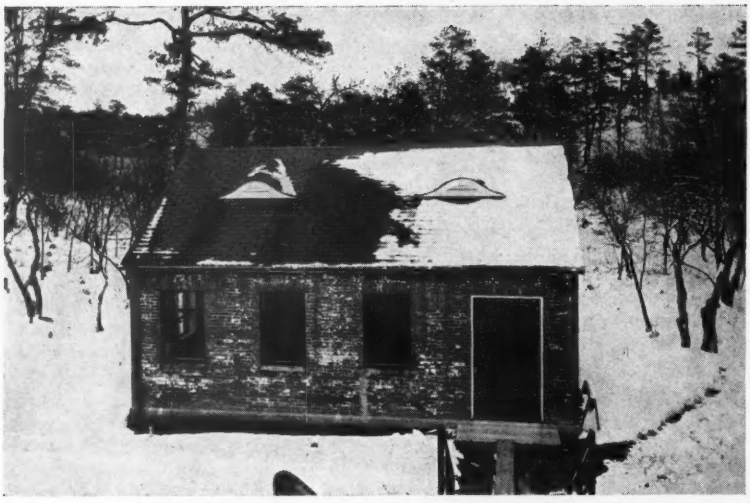


Fig. 3. An exterior view of the pumping plant showing its isolated location

rent generator. Pumping is against a head of 165 ft. into a 200,000 gal. elevated tank. Consumption of fuel oil amounts to approximately 2 g.p.h. of operation, and the total for the entire year costs less than $200.

Very little attendance is called for. The engines are started by means of a small gasoline motor operated by the attendant. The attendant also stops the engine when the tank is filled. After 4 yr. of operation the only engine repairs needed has been the replacement of one connecting rod bearing.

Each unit is operated on alternate runs so that both are always kept in first class condition. Also, by such alternate operation, the life of the equipment is greatly prolonged. Complete duplicate standby service is also provided for in this way, and of course in case of a bad fire both units could be run at the same time to take care of maximum requirements for water.

At the end of 1940 there were 69 house services, 58 hydrants and 8 mi. of mains. As might be expected on account of the summer colony the largest consumption of water was in August and amounted to 2,076,000 gal. The largest consumption in any one day was on Aug. 19 which came to 165,000 gal. Thus it will be seen that the pumping equipment is of ample capacity for present needs with provision for substantial growth. The Water Commissioners consider that Diesel power has proven perfectly satisfactory.

Protection Against Incendiary Bombs

War activity brings a direct threat of bombing to power plants. Chief menace is the incendiary bomb various types of which are described together with methods and means of fighting fires they are intended to start in power houses and nearby property

By WILLIAM H. EASTON
Safety Research Institute

SINCE THE POWER PLANT is the heart of the enterprise it serves, it must be protected as effectively as possible from attacks by air. Damage inflicted elsewhere on the premises may be only local in character, but even a slight amount of destruction inside the power house may force the entire enterprise to shut down.

What protective measures are necessary depend, of course, upon the location and character of the plant. All plants situated between the Atlantic Ocean and the Alleghenies and between the Pacific Ocean and the Rockies are considered to be within the main "target" areas, while some key defense industries lying far inland may be subject to the attention of raiding planes.

Protection from Incendiaries

Under present conditions, the incendiary bomb is the chief menace in the East, since it is unlikely that large formations of heavy bombers will attempt to fly the great distances that still separate us from hostile powers; but until the Pacific Ocean is completely under our control, the West Coast must be prepared to cope with both incendiaries and high-explosives.

Germany's favored incendiary is the light magnesium bomb, and Japan may also employ it, though present reports indicate a shortage of magnesium in that country.

The light magnesium bomb consists essentially of a thick-walled tube of magnesium alloy, 9 in. long and 2 in. in diameter. It has an ignition head, also made of magnesium, a tail fin made of sheet steel, and contains a starting charge of thermit, which consists of a mixture of granular aluminum and iron oxide.

Action of the Magnesium Bomb

This bomb weighs 2.2 lb. and, when dropped from a height of 5000 ft. or more, attains a terminal velocity of 350 ft. per sec. At this velocity, the bomb will penetrate ordinary roof construction of shingle, slate, tin, tile, or asbestos composition, but it will be stopped by 4-in. reinforced concrete, ¼-in. of steel, or a protective layer of 6 in. of sand in bags.

As the bomb follows a parabolic path in its descent, it may strike walls or windows; but walls of ordinary brick or masonry and wire-glass windows protected by heavy steel mesh will deflect it.

Thus, it should be comparatively easy to make a modern power house, and also outdoor electrical installations, oil storage tanks, coal piles, etc., fairly proof against these bombs. But the

power-house staff must know how to deal with them.

The bomb ignites on contact, starting the thermit reaction, which lasts for about a minute. During this reaction, incandescent metal may be scattered over a wide area and, in addition, an explosive charge, carried by perhaps one bomb in fifty, may go off. Hence, a bomb should not be approached for about a minute after its fall.

The thermit sets fire to the magnesium body of the bomb, which will burn quietly, at a temperature of 2500 deg. F., for about 15 min. if it is left undisturbed. Having due regard for any fire the bomb may start, it is quite safe to come close to the bomb during this period.

To dispose of it, three methods may be employed, involving the use of a water spray, dry sand, and a special extinguishing powder, respectively.

If the bomb has started a serious fire by the time it is reached, a spray of water should be used to combat it.

Use of a Water Spray

A solid stream of water must never be played upon a burning bomb, because an explosive action will take place. But this does not happen when water in the form of coarse spray is employed. The water speeds up the burning of the bomb, reducing the time to about two minutes, and also wets down the surrounding area, restricting the spread of fire.

The special spray nozzle, with which many power houses are equipped, is an ideal weapon, because it can be safely used on the bomb and on fires in ordinary combustible materials, in oil and other flammable liquids, and in live electrical apparatus. Supplementary extinguishing equipment must be provided, however, for use when the water supply is cut off by high-explosive bombing, or other causes, and in places out of reach of the hose lines.

For this purpose, standard water-filled or water-solution fire extinguishers can be used, the necessary spray being obtained by breaking the normally solid stream with the thumb against the nozzle. The technique in using a fire extinguisher on a bomb is to play the solid stream on the secondary fire and change to the spray when working on the bomb. At least two 2½-gal. extinguishers will be needed to dispose of a bomb and the resulting fire.

Types of fire extinguishers suitable for this use include: soda-acid, foam, loaded-stream, antifreeze, pump-tank, and the pure-water extinguishers used for protecting telephone switchboards.

As the streams from all of these extinguishers, except the last, are highly conductive, they must not be used on live high-voltage electrical apparatus.

When a bomb starts a fire in oil, without electrical hazards, the foam or loaded-stream extinguisher should be used.

Carbon Dioxide Extinguishers Ineffective on Bombs

Fire extinguishers using extinguishing agents other than water, such as the vaporizing-liquid and the carbon-dioxide types, are ineffective when used on the bomb itself, but can be employed for extinguishing the resultant fires.

When a burning bomb can be closely approached, it can be handled in the following manner. Cover it with a couple of shovelsful of dry sand; scoop up the mass of bomb and sand with a long-handled, square-nosed shovel; dump into a metal pail containing several inches of sand; slip the handle of the shovel through the handle of the pail; and, with the assistance of another man, remove it to a safe spot.

The pail must be handled as described because the sand will not extinguish the bomb, and, as it will continue to smolder, the pail will get very hot.

It is essential to use dry sand for this purpose, since burning magnesium will react with the moisture in damp sand.

Use of a Special Extinguishing Powder

Within the past year, a powdered compound, which actually extinguishes burning magnesium, has been developed. In view of its limited production, it is not generally available, but it may be possible to obtain it to protect defense industries or the power houses of important electric systems.

When a bomb falls upon an incombustible surface, such as a concrete floor, it is merely covered with the powder and left for disposal at leisure.

If the bomb falls upon a combustible surface, such as a wooden floor, a bed of the powder is laid on the floor close to the bomb. The bomb is then laid on this bed and covered with powder. It, too, can then be safely left for later disposal, if necessary.

Other Types of Incendiary Bombs

At the present writing it is understood that the Japanese are using thermit and oil incendiary bombs.

The thermit bomb consists of a metal container filled with thermit. They can be of any reasonable size.

The thermit reaction, when once started, cannot be stopped, since the oxygen required for the burning of the aluminum is provided by the iron oxide. The temperature of the reaction is about 4500 deg. F., which is more than sufficient to melt steel tools used in attempts to gather up the white-hot mass.

Hence, about all that can be done to cope with a thermit bomb is to wait until the reaction is over and then attack the resulting fires.

The oil bomb consists of a metal container filled with a petroleum product made into a jelly by dissolving soap in it. It, too, may be of any reasonable size.

A burning oil bomb is, of course, nothing but an oil fire, and can be successfully attacked with any fire extinguishing equipment having a class B rating, including: the special spray nozzle, and the foam, loaded-stream, vaporizing-liquid, and carbon-dioxide fire extinguishers.

Protection from high-explosive bombs is a matter of construction and organization. Both of these subjects are covered in official documents—Protective Construction and Protection of Industrial Plants and Public Buildings—which are obtainable from the Office of Civilian Defense, Washington, D. C. Many plants are, of course, coming under the supervision of federal authorities, who are determining the needs of the particular plant concerned.

According to a recent announcement by the WPB the production and distribution of incendiary bombs for demonstrator use by civilian groups has been prohibited, because manufacture of these bombs calls for the use of scarce materials, which include magnesium and metal containers.

The use of salt on incendiary bombs is unnecessary. A spray of water or dry sand still remains the most satisfactory and easily available materials.

The Inside of Arc Welding

New, all-color sound movie made available to the public by the General Electric Co. constitutes a complete course in the technique of arc welding. Comprised of six parts, each of which is complete in itself, it can be shown in approximately an hour. The films can be obtained for single showings or can be bought at print cost. The film is expected to play a big part in speeding up the training of thousands of prospective welding operators needed in the war effort

GENERAL ELECTRIC has recently made available to the public a new movie entitled "The Inside of Arc Welding." Because this film handles the subject of good arc welding technique from a strictly educational viewpoint, it should be especially helpful to welding trainees. One prominent authority has estimated that its use should help cut the training time of new welders 20 per cent.

From the films, with their close-up shots of the behavior of the arc and the molten weld metal, veteran welding operators can get a clear, concise explanation of welding phenomena never before available for study.

Virtually every modern device of the motion picture industry was employed by the Raphael G. Wolff Studios, Hollywood, in producing "The Inside of Arc Welding." Vivid charts, animation, demonstrations by expert operators, close-ups of the arc in action, as well as cross sections of good and bad welds are combined to bring to even the largest of classes the benefit of individual instruction—instruction that can be repeated at will as often as necessary.

Each of the six parts of "The Inside of Arc Welding" is complete in itself and covers in full detail one particular phase of arc welding. Each is 400 ft. long, 10 min. in duration, and can be used on sound-equipped 16-mm projectors only.

Clearly shown, explained, and emphasized throughout the six parts are the four principal factors of good welding—(1) current setting, (2) angle of electrode, (3) arc length, and (4) speed of travel, with their effect on control of the molten pool.

Part 1, FUNDAMENTALS, shows how good welds are made and what happens if any of the four factors are correctly or incorrectly controlled. The welds demonstrated in this reel are beads on flat plate.

Part 2, FLAT POSITION, and Part 3, HORIZONTAL POSITION, use fillet and groove welds to cover thoroughly the differences in the technique required when

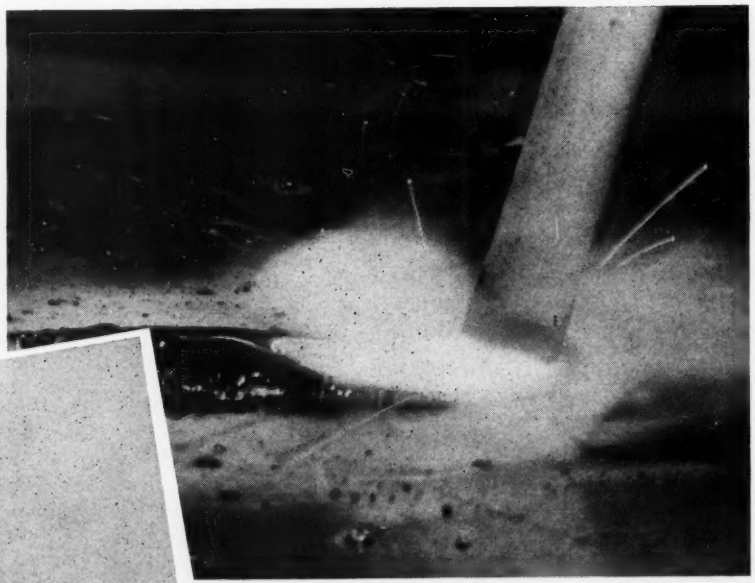


Fig. 1. (Above) A view from the movie showing an actual photograph of the electric arc in action. New methods had to be developed to permit filming the blinding arc with close-up photography

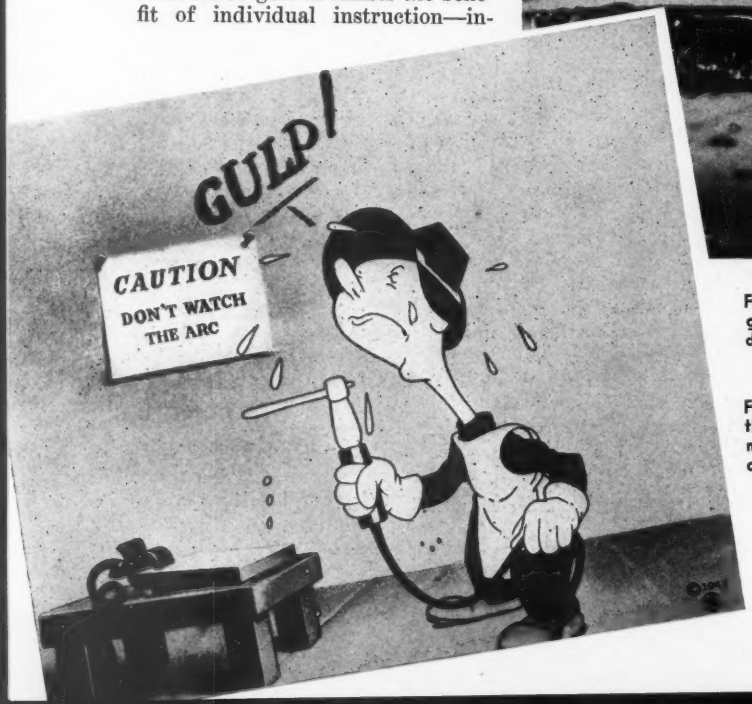
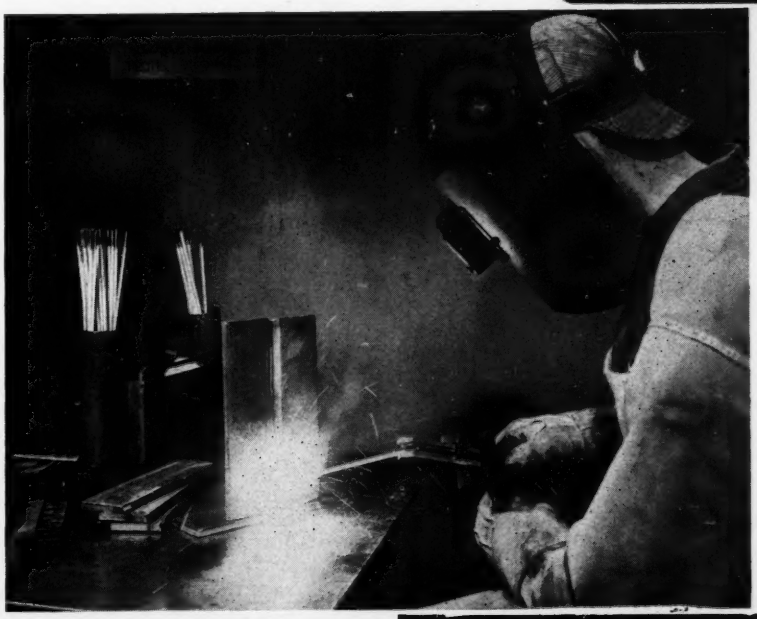


Fig. 2. (Left) Joe MaGee's afraid to strike an arc! Throughout the new General Electric all-color sound movie, striking animation mixed with a neat brand of humor adds punch to the treatment of the subject. Featured in the cartoons is Joe MaGee, the welder, the timid, but likable character shown here

Fig. 3. (Right) To show what goes on inside the arc this animation depicts the action of weld metal piling up to form the bead. This picture also shows the formation of the slag coating

Fig. 4. (Below) A view showing a welder working using the correct technique for making a vertical groove weld. Other parts of the film show the improper and proper angle of electrode for correct arc



welding in these two positions, as well as ways and means to control arc blow.

Part 4, ALTERNATING CURRENT—FLAT AND HORIZONTAL POSITIONS, demonstrates how both the beginner and the veteran can use larger electrodes, get higher speeds and increased deposition rates, as well as improved quality through minimized arc blow in a.c. arc welding.

Part 5, VERTICAL POSITION, and Part 6, OVERHEAD POSITION, also use fillet and groove welds to present in a vivid manner the do's and don't's when welding in these positions.

All terms, positions of welds, and electrode specification numbers used in the film refer to American Welding Society standards. Technical supervision was by the General Electric Welding Laboratories, with the co-operation of government and industry representatives.

The majority of the arc photographs were taken at a G-E plant where arc welding is used extensively. The Raphael G. Wolff Studios accomplished the filming of this difficult-to-picture process by the application of new lighting methods evolved by studio technicians after much research.

The new methods permit the filming of the blinding arc through the use of close-up photography with an elaborate lighting system which concentrates more than a million candlepower of external illumination on an area approximately an inch square.

The films may be obtained for single showings, or bought at print cost, by writing General Electric's Visual Instruction Section, Schenectady, N. Y., or the nearest G-E office or welding distributor.

Fig. 5. On a trailer suspended from a shop crane are Raphael G. Wolff, at the camera, and his assistant, Art Troutelaar, both of Hollywood, Cal.

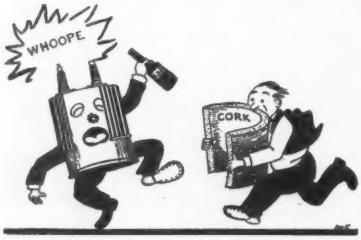
Things You Ought To Know

BY H. FAHNOE
Transformer Engineer
Westinghouse Electric & Mfg. Co.
Sharon, Pa.

Transformer noise, in certain types of installations, is very undesirable and lately considerable effort has been expended in developing methods for its control. In order to attack this problem it is first necessary to have a good understanding of the nature of noise in transformers. Noise is inherent in the operation of any transformer but it can be reduced to a minimum by proper construction. In this article the author explains the nature of transformer noise, how noise is measured and what the measured values mean. The user may not have much control over noise but should know something about it

THE FUNDAMENTAL CAUSE of transformer noise is an inherent characteristic, known as magnetostriction of the steel used in the core. When steel is magnetized it undergoes a change in dimensions. The magnitude of these changes depends upon the chemical and physical characteristics of the steel, the flux density at which it is worked, and its physical dimensions. If an alternating current is applied to the energizing winding of a transformer, the core vibrates, principally at a frequency twice that of the applied frequency, but many vibrations at odd and even harmonics of the fundamental are produced. These vibrations cause corresponding sound waves in the surrounding medium.

In oil-insulated transformers, vibrations are transmitted to the tank. At the bottom of tank transmission is in general by direct contact. In some installations these may be transmitted to buildings, steel structures, and surrounding objects, and may be very objectionable. However, such transmitted vibrations are readily reduced by elastic supports between the transformer base and its foundation. This support should be correctly designed, otherwise it may amplify the vibrations.



Transformer noise can be reduced by the use of elastic materials

Mechanical Design Influences Sound Level

The main source of sound emanating from a transformer, however, is the air-borne sound caused by vibrations of the tank wall, which are produced by core vibrations transmitted through the oil. Depending upon the tie between the core and the tank wall, amplitude of tank wall vibrations should in a properly designed transformer be less than those of the core, since it requires energy to move the oil and the tank wall. It is the designer's job to proportion core dimensions and tank wall so that none of these parts has free vibrations in resonance with the flux vibrations produced in the core. When resonance is eliminated, the sound level of an oil-insulated transformer with lapped joints in the core structure can be altered slightly only by careful building. It is common, though, to find transformers of the same design having quite different sound levels. Since magnetostriction of good grade transformer steel can be held within relatively narrow limits and as such would not account for variations of more than a few decibels in sound level, larger variations in sound level would point to the method of mounting the core on its base or to the manner in which the core is tied to the tank wall.

Coil vibrations caused by load currents are principally of twice the applied frequency, and if the coils are properly clamped the sound produced by these vibrations is practically masked by the sound caused by core vibrations. In a well built transformer, the difference in sound level between no load and full load usually is less than one decibel.

Radiators, cooling tubes, and others parts may vibrate and complicate the motions of the tank wall, but these parts in themselves are relatively poor sound radiators at the frequencies involved in transformer operation. They contribute relatively little, therefore, to the total sound level of the transformer. Rattling sounds produced by improper clamping of radiator fins and tap-changer shafts may be annoying if the listener is close to the transformer, but if these vibrations are not transmitted to large sound-radiating surfaces they are audible only a relatively short distance from the transformer. Such sources of noise can be eliminated by relatively simple means. Various means have been tried to reduce transmission of vibrations from core to tank wall, but a practical and economical method has not yet been found.

How Sound Level Is Measured

There are possibilities for producing steel which, in addition to well recognized transformer requirements, will have a low magnetostriction over the range of flux densities at which it is economically possible to use it. This would be the ideal solution to the problem of noise elimination in transformers.

Sounds are measured in units called decibels. Scientifically, decibels are defined as 20 times the logarithm of the ratio of energy between the sound to be measured and a standard sound, taken arbitrarily as the zero of the decibel scale. Practically, the decibel is about the smallest difference of

About Transformer Noise

Fig. 1. Engineers have found no economical means of reducing transformer sound, except by reducing the magnetic property of magnetostriction. The author conducts tests in a special sound-proof laboratory, whose wal's absorb almost all external noises, particularly between 100 and 1000 cycles

sound intensity that can be distinguished by a normal human ear. Several types of sound-level meters now used are calibrated directly in decibels above the standard reference level of 10^{-16} watt per square centimeter.

Test Code

Requirements for these meters have been standardized by the American Standards Association (A. S. A. standard No. Z-24.3). Sound-level meters usually are provided with three weighting networks, 40, 70, and Flat, which provide over-all frequency-response characteristics closely approximating those of the average human ear at corresponding loudness levels. For transformers sound level is specified in terms of the 40-decibel frequency response. A general test code of apparatus noise measurements has been prepared by the A.I.E.E. (No. 520) and directions for measurements adopted. The principal ones are:

1. All sound level measurements shall be made with the transformer energized at normal voltage and frequency with no load.
2. The measurements shall be made one foot from the major sound-producing surface of the transformer; and approximately uniformly spaced around it. Measurements locations shall not be more than 8 ft. apart and not less than 8 shall be used. (The major sound-producing surface is taken as the periphery over radiators, tubes, switching compartments, potheads, etc., but neglecting minor projections such as valves and thermometers.
3. For units less than 8 ft. in over-all height of tank, measurements shall be made at approximately half height. For units 8 ft. and over in height, measurements shall be made at approximately ½ and ⅔ height.
4. The average sound level of a transformer may in general with sufficient accuracy be determined from the arithmetic mean of the sound level readings taken as specified in paragraphs 2 and 3.

It is preferable that the measurements be made in a space having an ambient sound level preferable 10 decibels lower than the sound level of the transformer and ambient combined. If the difference is 10 decibels or less, the actual sound level of the transformer is less than the combined level measured, and a correction should be applied as given here:

Difference in DB between ambient plus apparatus sound level and ambient sound level	7	8	9	10	Over 10
Correction in DB to be applied to ambient plus apparatus sound level to obtain apparatus sound level	−1.0	−0.8	−0.6	−0.4	0

Large acoustically reflecting surfaces, other than the floor or ground, shall not be within 10 ft. of the transformer when the measurements are made.

When transformers are installed in banks, it is not possible to obtain the correct sound level of the individual units in case the units are placed close together, since there is a "built up" sound effect between the individual units. Theoretically, in a bank made up of units having the same sound level, the combined sound level of two units is 3 decibels higher than that of one unit, and the combined sound level of three units is 4.7 decibels higher than that of one unit. Practically, the actually combined sound level is somewhat less because of the spacing of the different units.

Acceptable Sound Levels

The transformer section of the N. E. M. A. has proposed average sound levels for transformers depending upon their kv-a and voltage rating. The values are given in the accompanying table.

These sound levels are based upon present transformer practice and are derived from physical dimensions of the core, average flux density at which the core is normally worked, and average magnetostriction characteristics of the steel.

From the standpoint of utility companies these sound levels, taken by themselves, do not rep-

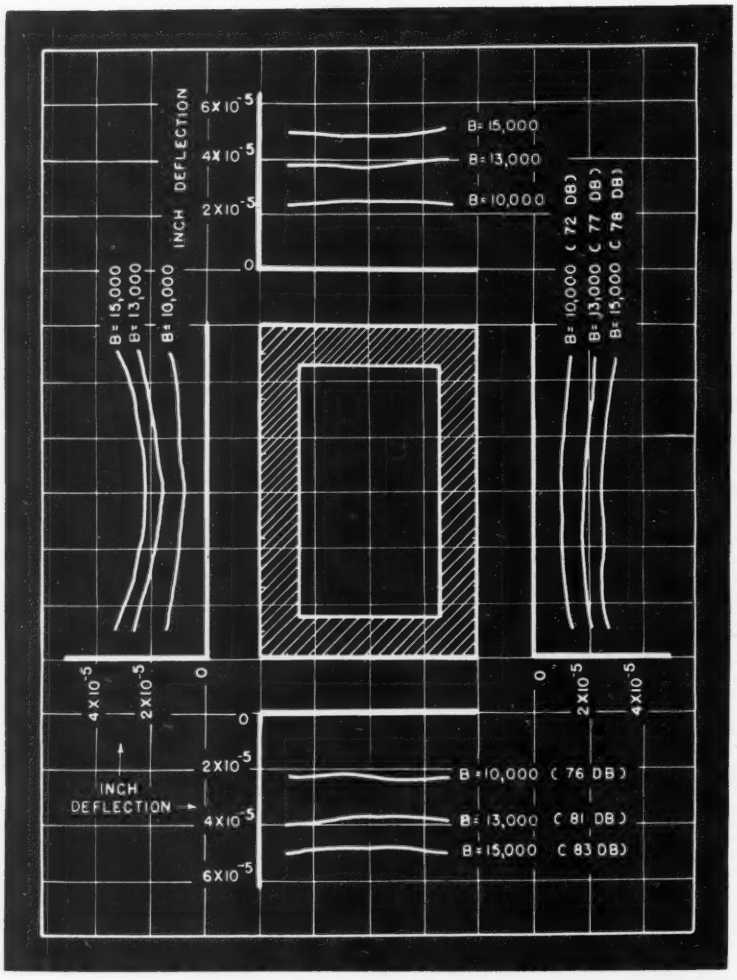


Fig. 2. 120-cycle core deflections parallel with the plane of laminations at 60-cycle excitation

resent a satisfactory measuring stick if quiet operation is desirable or if complaints may be anticipated. The principal factors that determine whether a transformer of a given sound level will be satisfactory in a given location are:

1. Lowest background or ambient sound level in the vicinity.
2. Location of the transformer and surrounding buildings relative to this place.
3. Physical dimensions of the transformer.

With a small transformer in open space sound level theoretically should decrease 6 decibels for every doubling of the distance from the transformer. The reference sound level preferably should be measured at not less than 4 ft. from the transformer when this measuring stick is used. For larger units, the decrease in sound level with distance is seldom more than 5 decibels for every doubling of the distance, when the reference sound level is measured approximately 8 ft. from the transformer. For a bank of transformers, the combined sound level of the bank should be used as a base. These figures do not apply when large sound reflecting surfaces are present. In such cases, the sound level measured a few hundred feet from the transformers may be about as high as close to the transformer, and at intermediate points considerably less. For transformer "noise" to become inaudible to the average human ear, its level must in general be decreased from 8 to 12 decibels below that of the background sound level at the place where the noise problem is of importance. This decrease depends somewhat on the relative sound spectrum of the transformer, and on the background noise.

Proposed Average Sound Levels for Transformers

55° C. Kv-a.	DECIBELS 69 Kv. & Below		92-115-138 Kv.		161 Kv. & Above	
	Without Fans	With Fans	Without Fans	With Fans	Without Fans	With Fans
0-300	56	70	..	..	..	..
301-500	58	70	..	..	..	..
501-700	60	70	..	..	..	..
701-1000	62	70	67	72	..	..
1001-1500	63	70	68	73	..	..
1501-2000	64	70	69	73	..	..
2001-3000	65	71	70	74	72	76
3001-4000	66	71	71	75	73	76
4001-5000	67	72	72	76	74	77
5001-6000	68	73	72	76	74	77
6001-7500	69	73	73	76	75	78
7501-10000	70	74	73	76	75	78
10001-12500	71	75	74	77	76	79
12501-15000	72	76	75	78	77	80
15001-20000	74	77	76	79	78	81
20001-25000	75	78	77	80	79	82
25001-30000	76	79	78	81	80	83

SABOTAGE FIRE PREVENTION

PRECAUTION which every plant can take to guard against arson coupled with explosion as a means of causing destructive sabotage were listed recently by Joseph F. Gillece, Special Agent of the Arson Department, National Board of Fire Underwriters. The list follows:

Carefully guard and periodically inspect all stand-pipes, hose and extinguishing equipment, including portable and built-in extinguishers, and sprinkler systems and valves. Be vigilant in preventing interference with private alarms and watchman systems.

Know all you can about your employes. Check carefully the country of birth, racial origin and war sympathies of all employes and applicants for employment; pay attention to habits and associates of all key workers.

Examine carefully not only all incoming shipments, but also all packages and containers, including lunch boxes, carried into the plant.

Utilize an effective system of plant police and guards, allowing no unauthorized persons to enter the premises.

Select your plant watchmen from men who are alert, vigorous, and in fine physical shape. It is a serious error in these times to allow superannuated employes to be entrusted with the demanding job of efficiently watching your plant and acting decisively when danger arises. Give these old men an easier job. I know of one plant which was completely destroyed because an elderly watchman could not stay awake and alert.

Be sure your plant has adequate fire fighting equipment.

Train key employes in proper use of this equipment.

FUEL OIL HEATERS

Part III. Practical aspects of fuel oil operation, care and maintenance for best results

By E. G. ROBERTS*

WITH MECHANICAL atomization the viscosity requirements for pumping usually fall between 4000 S.S.U.[5] and 700 S.S.F.[6], with a temperature of about 100 deg. F., and for atomization requirements a value of 150 S.S.U. for Bunker C oil about 210 deg. F. For steam atomization a viscosity of 40 S.S.F. is advisable and is generally obtained at a temperature of about 185 deg. F. The specific oil viscosity values may be obtained from a check on boiler operating data after installation to obtain the oil temperatures which can be easily transferred to viscosity values from the charts.

Overall dimensions can be selected from manufacturer's data based on the number of tubes of given effective length suitable to the space conditions within the plant. The tube size must be adequate to allow fairly high velocities under continuous operation. After long periods of use, hard burned fuel oil will adhere to the inner tube wall, lowering the velocity of the oil and sharply decreasing the rate of heat transfer.

In oil heater design, a balance must be obtained between the tube size, the number of tubes per pass, the average velocity desired, and the weight. The weight has a direct relationship with the heater cost. More weight indicates heavier tubes, tube heads and shells, and more expensive fabrication. Too low a velocity will slow up the rate of heat transfer. The heater capacity will be directly affected because the time required to assure a predetermined quantity of heat transferred will increase, requiring longer tube length, or providing lower discharge temperatures for the given conditions.

Too high a velocity creates excessive pressure drops and some clogging. Deposits on the tubes will occur, dependent mainly on the homogeneity of the oil and the amount of flocculent matter carried. Blended oils cause more trouble in this respect because of variation in the oil density. Too many tubes complicate the tube fabrication and increase the cost. The pressure drop varies directly with the viscosity and inversely with the logarithmic mean temperature difference.

With the same oil the viscosity will vary little at different rates of flow, thus the pressure varies directly with the rate of flow as is to be expected. As the oil velocity decreases, the pressure drop and the oil flow in gallons per hour decrease and the mean temperature difference increases somewhat. These facts are important in gaging operating conditions at loads below the maximum. Too low a velocity at one-quarter or one-half load will seriously affect the heater efficiency due to oil carbonization and poor heating in outer oil layers.

Heaters are designed to handle the specified fuel oil under variable load requirements. Cracked fuel oils have low viscosity for high specific gravity, and require less preheating,[7] only to about 120-150 deg. F. The heat value per gallon is higher and they are also easier to handle and store in the winter. These oils are often unstable, however, or if not may become unstable when mixed with other fuel oils, especially lighter distillates.

Unstable fuel oil may form deposits on the tubes if the heat transfer rate is too high or in tube construction of the type discussed below. The type of heater that has given best results with cracked residue oils is one which provides a narrow annular space of large sectional area through which the oil moves spirally at low velocity.[8] Steam at low pressure is used for heating and the possibility of shock heating is obviated. Under similar load conditions the uncracked fuel oil would require a heater of twice as many tubes and over twice the heating surface while the cracked residue fuel oil would need a heater of one-fourth the heating surface and number of tubes of the Bunker C heater.

In the case of uncracked fuel oils the viscosity and specific gravity are related so that correct preheating can be based on API gravity. This is not true for cracked residue fuel oils which are blends of several specific gravities and which should be preheated only on the basis of viscosity if proper atomization is to be obtained.

Fouling and Its Effect

Effect of fouling conditions due to the accumulation of hard burned oil, carbon deposits or foreign matter within the tubes can be anticipated in the design of heaters. The amount of extra tube surface required for normal performance over a period of time with fouling present, is a pure guess. Assuming varying thicknesses of average tube wall deposits over the entire tube length the overall effect on the coefficient of heat transferred can be approximated. The addition of a scale or dirt as heat resistance to the overall heat transfer coefficient becomes an acceptable means of providing a fouling factor in heat exchange design. It will further serve to determine by approximate calculation the extent of inefficiency to which the heater can be reduced. By use of the following equation[9] rough estimates of the increased resistance to heat

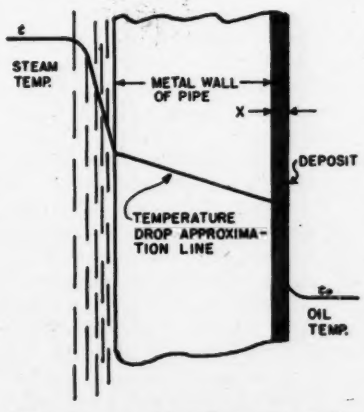


Fig. 7. Diagram of heat flow resistance illustrating the application of the formula given in the text for approximating the influence of carbon deposits

*Formerly Associate Engineer, Power Div., Federal Works Agency, Washington, D. C. Part I appeared on p. 67 of the March issue and Part II on p. 73 of the April issue.

[5]Seconds Saybolt Universal and Seconds Saybolt Furol, A.S.T.M. D 88-38. The latter is used for heavy oils and the over-flow time is approximately 0.1 that of the Universal.

[6]Martin, K. L., Combustion, Sept., 1938.

[7]Hanlon, M. J., Mechanical Engineering, April, 1935, p. 242.

[8]Hanlon, M. J., Mechanical Engineering, April, 1935, p. 242.

[9]A. S. M. E. Heat Transfer papers, Dec., 1934-5. E. N. Sieder, p. 82.

Table IV. Calculated effect of carbon deposits on a two pass heater with 53 sq. ft. of heating surface made up of 1¼ in. tubes and using 125 lb. saturated steam (K = 0.087 B.t.u. per sq. ft. per deg. F. per hr. for oil)

Increase in deposit thickness, in.....	clean	1/64	1/32	1/16
Reduction in temperature rise, deg. F....	116	73	55	33
Reduction in log. mean temp. diff., deg. F.	175	140	124	102
Reduction in over coeff. of heat transfer.	50	28.6	20	12.5
Loss in heat transferred, B.t.u. per hr...	464,000	212,000	131,500	67,500

flow for a series of deposits on the tube wall can be made.

$$\frac{1}{U_t} = \frac{1}{U_r} + r$$

Where

U_t = Total heat transfer coefficient in B.t.u. per sq. ft. per deg. F. per hr.

U_r = Regular, or clean tube, coefficient in B.t.u. per sq. ft. per deg. F. per hr.

r = is the ratio of the thickness (x) to the conductivity (K) of the deposit, with the thickness expressed in ft. and the conductivity in B.t.u. per sq. ft. per deg. F. per hr. per foot of thickness. A value of 0.087 has been used in the calculations for K.

The values of the overall coefficients of heat transfer, for a 1¼ in. tube, would vary as shown in Table IV for these specified average deposits on the outer tube wall for, in this case, normal load.

It is well to consider the effect of fouling on the characteristics of the heater selected and to note the effect of various thicknesses of tube deposits on the temperature rise. A further indication of the reduced efficiency will be shown by the drop in the discharge temperature of the oil. In actual operation the amount it decreases will depend on the actual thickness of the scale deposits on the tube wall and the quantity of oil heated. With dirty equipment the effect of increased velocity on heat transfer rate is not as important as some have believed. Changes in temperature rise in the heaters should be given close attention for signs of clogging or deposits in tubes. High heat transfer rates with tubes of small diameter in heaters require a more frequent inspection and cleanings of the tubes. Cleaning is important as a regular routine event.

It was not the intention of these articles to indicate the design of fuel heaters, but to discuss these factors that are involved in the intelligent selection of a heater to serve the actual requirements with the competent data made available by the manufacturers.

Arbitrary specifications for fuel oils of different distillates which force the oil companies to blend oils and raise prices should be avoided. Large quantities of straight run oils or cracked residuous oils where available are easily equipped with proper pumping and atomizing units. To meet higher rates of heat release in small furnaces volumes, comparable with engineering improvements in fuel firing and handling equipment, will require more efficient oil burners, which mean more effective oil heating in larger quantities under more severe load demands.

Higher oil pressures for mechanical atomizing oil burners for controlling oil capacity by the oil volume will present new and different demands on the cycle of fuel oil preheating. Thus the task of selecting fuel oil heaters requires close study, better knowledge of the contributing factors and close examination of the variations in the known constants for proper selection of the right heater to meet the majority of the load demands.

COAL CHANGES DURING STORAGE

Tests have been made by the U. S. Bureau of Mines on a 3-ton sample of subbituminous coal stored for 180 days under various conditions and the full results are given in the Bureau's Report of Investigations 3587 prepared by V. F. Parry and John B. Goodman, technologist and chemist, respectively, of the Bureau. The best conditions for storing such fuels as found by the Bureau are outlined here

SUBBITUMINOUS COAL or lignite when stored in random piles or in ordinary bins in which the temperature fluctuates and air circulates quickly undergoes objectionable physical and chemical changes, which decrease the utilization value of the fuel and increase its tendency to ignite spontaneously. Slacking takes place, and the heating value decreases. These changes are accelerated by fluctuations of temperature and by circulation of air through the storage space.

When such coals are exposed to the weather they lose moisture rapidly. If evaporation from the surface of a lump proceeds at a faster rate than that at which it is re-

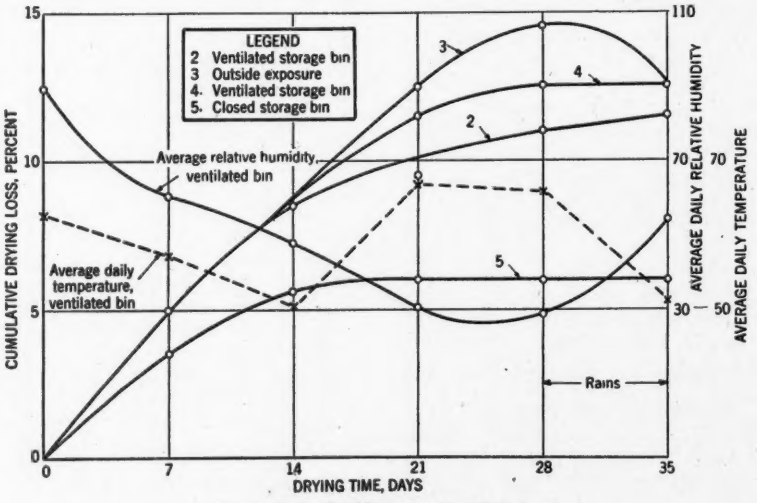


Fig. 1. Rate of subbituminous coal drying

placed by moisture from the interior, the rate of shrinkage at the surface is greater than that at the interior; consequently, stresses are generated at the surface which cause the coal to disintegrate. Likewise, when moisture is absorbed by the air-dried surface the outside layers expand at a faster rate than the interior, which results in further breakdown. As these cycles are repeated the lump may disintegrate completely. Therefore, successful storage of low-rank coals depends on control of the factors that influence change of moisture.

Industrial practice has shown that several thousand tons of lignite can be stored successfully for many months in earthern pits in which only the top surface of the coal is exposed to the weather. This method of storage reduces both circulation of air and fluctuations in temperature; it is feasible for large industrial plants, but is not convenient or economical for small consumers. Thousands of tons of subbituminous slack are stored under water for several months each year at the sugar factories in northern Colorado. Underwater storage of fresh coal prevents change in moisture content and eliminates spontaneous combustion.

Since many consumers find it necessary to store small quantities of subbituminous coal and lignite for 1 to 3 mo. in basement bins or in medium-size bins serving industrial plants, information as to the effect of various conditions of storage is of value in eliminating some of the troubles due to degradation.

Source of Sample

Coal used in this investigation was obtained from the Puritan mine, Dacona, Weld County, Colo. This mine is in an unnamed bed of the Larimer formation, which ranges in thickness from 6 to 10 ft. The properties of this coal are typical of the coals mined in Weld County, which have an average bed moisture content of 23.8 per cent. A 3-ton sample was cut from the fresh face at a point in the mine designated as "8-south back of parting, north side." A standard bed sample was taken for the proximate and ultimate analyses. At the designated point in the mine a 10-ft. bed of coal is worked and 18 in. of roof coal is left. The sample was shipped to the Golden field station in large sealed drums immediately after being taken.

TABLE I. Analysis of Bed Sample in Center of Section Sampled, Puritan Mine

	As received	Moisture free	Moisture and ash-free
Air-dry loss, 12.8			
Proximate analysis:			
Moisture	24.1		
Volatile matter	29.1	38.3	40.5
Fixed carbon	42.7	56.2	59.5
Ash	4.1	5.5	
	100.0	100.0	100.0
Ultimate analysis:			
Hydrogen	6.3	4.8	5.1
Carbon	55.0	72.4	76.6
Nitrogen	1.2	1.6	1.7
Oxygen	33.1	15.3	16.2
Sulfur	.3	.4	.4
Ash	4.1	5.5	
	100.0	100.0	100.0
B.t.u.	9,460	12,470	13,190
Softening point, ash, °F	2,050		

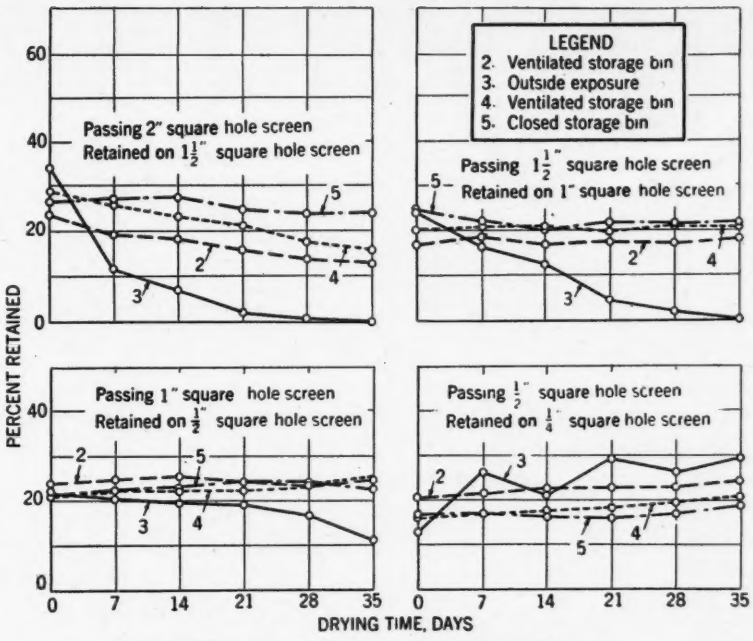

LEGEND
2. Ventilated storage bin
3. Outside exposure
4. Ventilated storage bin
5. Closed storage bin
Passing 2" square hole screen
Retained on 1½" square hole screen
Passing 1½" square hole screen
Retained on 1" square hole screen
Passing 1" square hole screen
Retained on ½" square hole screen
Passing ½" square hole screen
Retained on ¼" square hole screen
PERCENT RETAINED
DRYING TIME, DAYS

Fig. 2. Degradation of samples of Puritan coal

Table I gives the proximate and ultimate analyses of the coal and the softening temperature of the ash. This coal is classified as subbituminous B as its dry, mineral-matter-free, fixed carbon is 59.5 per cent and the moist, mineral-matter-free, heating value is 9870 B.t.u. a pound.

Two storage bins, one closed and the other ventilated, were used for this investigation and are identical in construction. The over-all length of each bin is 25½ ft., the width 13 ft., and the head room 6¾ ft. at the sides to 7 ft. at the center. The reinforced concrete walls are 8 in. The roof is also reinforced concrete, but is 5 in. thick. It is supported by two rows of 3½-in. steel pipes, which form an aisle 3 ft. in width. These roof supports also serve to subdivide the bin into eight storage compartments of 2 tons capacity each. A 24-in., cast-iron, flanged, manhole ring with cover and rain guard serves each pair of compartments. These form tight, waterproof hatches for loading coal into the bins. No other openings are provided except the tight, metal-sheathed doors at the front. The bins were painted white to reflect radiation.

Table II gives the proximate and ultimate analyses of the coal at three different periods during storage; from a consideration of which it is evident that the coal substance has oxidized only slightly.

The results indicate that coal stored in a ventilated bin for 35 days or allowed to remain in closed, undisturbed storage for 180 days does not differ significantly from fresh coal on a moisture- and ash-free basis. In fact, the variation in heating value about equals the tolerance permitted in heating-value determinations. The oxygen content of the coal substance actually increased only 1.2 per cent of its original value in 180 days' storage in a closed bin. The calorific values of the coal substance decreased only 0.6 per cent during 6 mo. storage.

Table III gives the results of the friability test on the samples taken from the 2-ton air-dried sample at periodic intervals.

The change in size consist of the 1-ton sample stored for 3 mo. under favorable conditions in the

TABLE II. Analysis of Coal Samples During Storage

	As received			Moisture-free			Moisture- and Ash-free		
	Fresh seam	35[1] days	180[2] days	Fresh seam	35[1] days	180[2] days	Fresh seam	35[1] days	180[2] days
Proximate analysis:									
Moisture	24.1	17.6	22.1	.....	.....	.....	.....	.....	.....
Volatile matter	29.1	31.4	29.4	38.3	38.1	37.7	40.5	40.4	39.9
Fixed carbon	42.7	46.2	44.2	56.2	56.1	56.8	59.5	59.6	60.1
Ash	4.1	4.8	4.3	5.5	5.8	5.5	....	....	....
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Ultimate analysis:									
Hydrogen	6.3	5.9	6.1	4.8	4.7	4.7	5.1	5.0	4.9
Carbon	55.0	59.5	56.2	72.4	72.1	72.2	76.6	76.6	76.4
Nitrogen	1.2	1.2	1.1	1.6	1.5	1.4	1.7	1.6	1.5
Oxygen	33.1	28.3	32.0	15.3	15.5	15.8	16.2	16.4	16.7
Sulfur	.3	.3	.3	.4	.4	.4	.4	.4	.5
Ash	4.1	4.8	4.3	5.5	5.8	5.5	....	....	....
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
B.t.u.	9,460	10,210	9,650	12,470	12,400	12,390	13,190	13,160	13,110
Softening temperature ash, °F.	2,050	....	2,060	....	....	....	....	....	....

[1]This 2-ton sample was air-dried for 35 days in a ventilated concrete bin.
[2]This 1-ton sample was stored in a closed bin and not disturbed after a screen analysis was made except to make another screen analysis at the end of 90 days. Sample for chemical analysis was taken at end of 180-day period.

dark, closed bin is given in Table IV. Only a slight breakdown of the larger sizes and a minor increase in the smaller sizes occurred during this period.

Figures 1 and 2 show in graphic form some of the observations made on the several small samples, including temperature, humidity, loss of weight, and degradation.

TABLE III. Friability Tests on Dried Samples

Test No.	Condition	Friability percent	
1	Fresh	16.1	27.3
2	10 days air-drying	21.6	32.5
3	10 days air-drying	38.4	46.9
First cycle slacking index, fresh coal			64.0

The data collected clearly show that friability of this strongly slacking coal increases with continued air drying. Figure 1 shows the rate of drying under the various conditions of exposure. The moisture loss from the samples stored in the ventilated bin and from the sample exposed to outside conditions was the same for the first 14 days. After that the sample exposed to natural weathering conditions showed a more rapid loss of moisture than was indicated for the two other samples. In samples 2 and 4 (stored in the ventilated bins) the rate of drying remained fairly uniform but decreased in the last period. In the case of sample 5 (stored in a tray in the closed, dark bin) the initial rate of moisture loss for the first 3 wk. was fairly rapid and uniform, but during the remaining 2 wk. it apparently reached equilibrium with the atmospheric conditions in the bin. The moisture lost from this sample, 6 per cent, is more than would have been lost if the sample had not been screened each week, which exposed fresh surfaces. A better measure of the moisture loss in the closed, cool bin is given in Table II, which indicates that an undisturbed pile of this coal will lose only 2 per cent moisture in 180 days if properly stored in a small, closed bin.

The degradation of the four 100-lb. samples under various conditions of storage is illustrated in Fig. 2, which shows comparative graphs of the degradation expressed by retention on different-size screens. The early breakdown of the sample exposed to weather, the slower degradation of samples in the ventilated bin, and the resistance to degradation of the sample stored in the closed bin, as shown by the uniform retention on the various screens, should be noted.

The results of a previous investigation carried out by Porter and Ovitz indicated that under unfavorable conditions for storing slacking coal the heating value declined 0.7 to 2.3 per cent during 3 mo. in the closed bins and in 9 mo. the loss in heating value was approximately 4 per cent. The loss in heating value during 2¾ yr. was 3 to 5 per cent, the greater part of which (70 to 80 per cent) occurred in the first 9 mo. Porter and Ovitz point out that tight sidewalls and bottoms are more important than top covers in protecting subbituminous coal from deterioration, and they found that the cracks in the walls of both the open and closed bins were responsible for rapid deterioration of the coal. These investigators recommended the use of tight concrete bins for proper storage of slacking coal.

The present investigation has shown that during 6 mo. storage in a closed concrete bin the loss in heating value of a similar coal was only 0.6 per cent.

TABLE IV. Effect of Storage for 3 Mo. in a Closed Concrete Bin on Screen Analysis of Coal

Size square-mesh screen	Percentage retained on screen: Fresh coal	Stored 3 mos.
Passing 2 in., retained on 1½ in.	26.5	20.4
Passing 1½ in., retained on 1 in.	24.0	21.8
Passing 1 in. retained on ½ in.	21.0	26.2
Passing ½ in., retained on ¼ in.	17.0	19.1
Passing ¼ in.	11.5	12.5
Average size, in.	0.999	0.916
Size stability[1]		0.917

[1]Size stability = Average size degraded coal / Average size fresh coal

STOCK COAL NOW

DONALD M. NELSON, chairman of the War Production Board, urges all consumers of coal, especially large industrial users and war plants, to begin stockpiling coal at once and to increase inventories of this fuel to the limit of storage capacity.

Transportation difficulties will increase in future months, but the railroads and other transportation facilities still have some surplus carrying capacity which must be utilized now in order to avoid serious transportation dislocations next fall and winter.

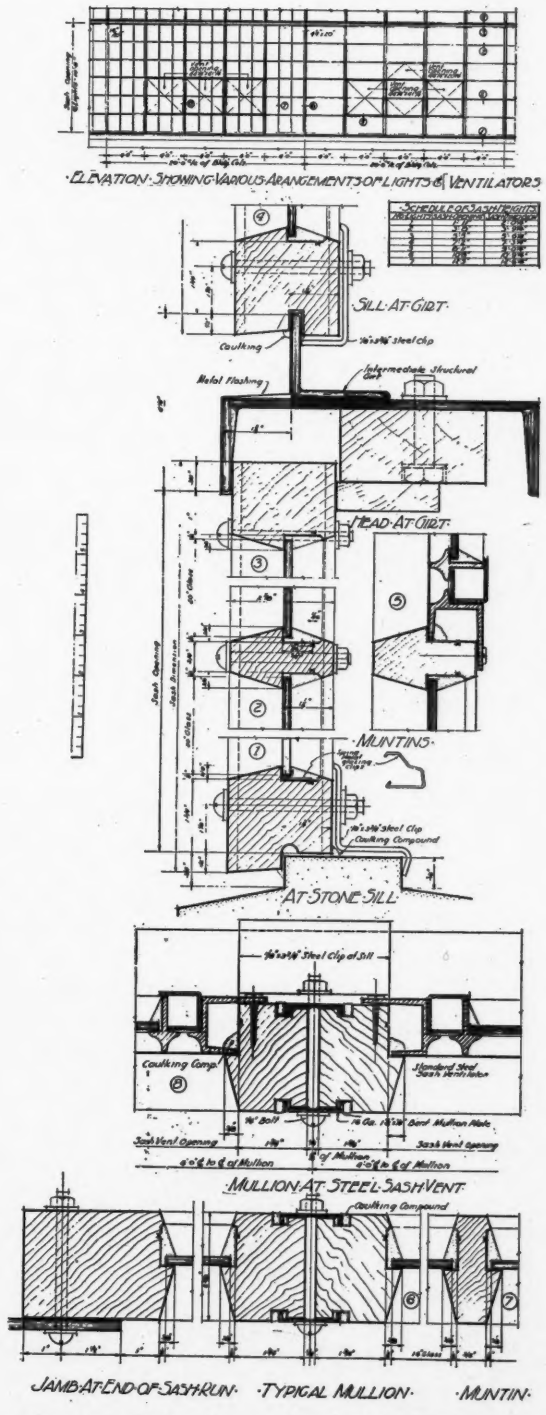
Moreover, the fuel oil situation on the East Coast and winter weather transportation problems make stockpiling operations now of great importance to all consumers who are now dependent or who may later become dependent on coal for heating their homes or running their plants and factories.

In addition to transportation problems, it is obvious that much more coal than ordinarily will be consumed. All these factors add up to the fact that all demands can be met and operations running smoothly only if mining and transportation of coal during the year are planned so that steady maximum use is made of production and transportation facilities.

If this is not done, there will undoubtedly be serious transportation problems, probably involving emergency rationing, which might otherwise be avoided.

NEW VICTORY SASH TO SAVE STEEL

In the interest of the War effort, inventor waives patent rights on a new sash designed to save vital materials, have a high strength and be adapted to blackout requirements



Details of the new Kahn Victory Sash, which uses wood and hence conserves steel for more vital war purposes. Albert Kahn Associated Architects and Engineers, Inc., Detroit, Mich., developers of the sash, have waived patent rights and will send blueprints to all architects, engineers and contractors who want to use the sash

WITH THE Government's restriction of the use of steel wherever possible to expedite manufacture of ships, guns and munitions, an entirely new type of wood sash has been developed by a member of the firm of Albert Kahn Associated Architects & Engineers, Inc., of Detroit, which will serve for industrial and other buildings quite as well as the standard steel sash employed these many years.

In order that the new sash may be available to all architects, engineers and contractors engaged in designing and building war production plants, John Schurman, its designer, and the Albert Kahn organization, of which he long has been a member, have waived all patent rights to the development. Blueprints describing the new sash in detail are available to the entire war production building industry.

Certain that the new development will play an important part in winning the war, the sash has been named Victory Sash. In creating the Victory Sash, full advantage was taken of experience gained in the development of steel sash, with its simple frame and mullion construction and its simple, compact ventilators, all built up at the factory in standard units. The extreme heights possible in single units mean considerable saving in horizontal supporting members, allowing maximum light for the amount of material used.

In the sash only two mullion supporting members, each measuring approximately 2 by 4 in. are used. The great majority of the frame members common to old-fashioned wood sash are eliminated. Instead of supporting complicated frames, stops and other elements, which, in turn, held the sash, the 2 by 4's, so-called, now directly hold the glass.

Caulking Gives Weather-Proofing

Each unit is built complete in the mill and shipped to the job where it is erected between head and sill. No other frames or sills are required. The wood sash is erected in the field in the same manner as steel sash is put in place. As the units are erected, the mullions are joined by a coverplate of light pressed metal with a small intervening space for expansion and contraction. Caulking compound furnishes complete weather-proofing. At the sills, the wood sash is secured by metal clips clamped only at the mullions with regular mullion bolts. Caulking at these points provides the necessary weathering. The sill is so designed as to eliminate crevices in which dirt and moisture might accumulate.

Since most industrial buildings have 20-ft. column centers in the outside walls, a 4-ft. standard has been adopted though this, of course, is subject to change. Conventional wood sash is always glazed on the outside and thus is subject to deterioration as result of its exposure to sun, rain and frost. Glass is held in place by metal brads rigidly secured against its surface. This rigid glazing method is responsible for much glass breakage. Almost invariably, cracks in the glass radiate from the points at which the brad fasteners are located.

(Continued on Page 134)

War News From the Industrial Front

Compensatory Adjustment Regulation I

THE TEXT of Compensatory Adjustment Regulation I, now in effect, outlines the mechanics whereby receivers of bituminous coal in New York and New England can file applications under the plan for Government absorption of increased transportation costs.

Curb on Steam Power Equipment

PRODUCTION, sale and delivery of heavy power steam equipment was restricted late last month to war agencies, lend-lease, the United Nations and purchase orders carrying military priority.

Intent of the order, the WPB said, was to guarantee that no power equipment was "put into production for any but highly essential purposes." Further, it prevents firms from obtaining new equipment under their standing priority ratings covering repair and maintenance.

Restrictions do not apply to sales or deliveries to regular distributors to fill orders previously received, or, to equipment already in transit.

Scarce Materials Curbed For Safety Equipment

IN ORDER to conserve the supply of materials urgently needed in war production, strict regulations on the use of several commodities in the manufacture of safety equipment were put into effect by the WPB May 5.

Safety equipment, as defined by the order, includes guards, shields, containers, harnesses, headgear, belts, shoes, protective clothing or coverings, masks, respirator inhalers, resusitating apparatus, measuring instruments, indicating instruments, protective creams, treads, warning signs and all other such safety articles.

The order prohibits the use of scarce materials in these items except for delivery to the Army, Navy, or Maritime Commission. The critical materials affected are aluminum, asbestos cloth, chromium, copper, copper base alloys, nickel, corrosion resisting steel, alloy steel, tin, synthetic plastics, magnesium, rubber, synthetic rubber and neoprene.

Shift Coal Transport from Water to Rail

STEPS are being taken by the Office of Defense Transportation to insure the movement into the Eastern Seaboard Region of large amounts of coal which formerly moved by water along the coast.

Curtailment of the coastwise shipping as a result of enemy submarine activity and other factors has made railroad routing necessary. Much of the coal that formerly moved by rail to tidewater for transshipment by collier must now move the entire distance to Baltimore, Norfolk, Philadelphia, and New England points by rail.

Samuel S. Bruce, of Pittsburgh, has been appointed assistant director of the Division of Railway Transport in charge of coal movement and equipment.

Releases Machinery Plant After Study

WPB revoked in April its special conservation order, issued February 21, which halted the sale at auction of the machinery, tools, and equipment situated at the plant formerly owned by the Foos Gas Engine Co., at Springfield, O.

Purpose of the order was to permit a survey and its facilities to determine whether they could be used intact for war production. Subsequent investigation by the Navy Department and the WPB failed to disclose any valuable use which could be made of the plant as it stands.

Indian Kyanite Under Allocation

INDIAN kyanite (including andulusite and sillimante), a super duty refractory used in furnaces where extremely high temperatures are necessary, was placed under complete allocation control May 6 by the Director of Industry Operations.

No Rubber Tires for Hand Trucks

ELIMINATION of all but the most essential uses of rubber tires on hand trucks was made in May by the WPB. It is estimated that these required more than 500,000 rubber tires last year. Limitation Order L-111 prohibits any manufacturer from delivering rubber-tired hand trucks, any person from accepting delivery of such trucks, or, of rubber tires for replacement purposes, and any person from delivering rubber tires except on authorization to a hand truck manufacturer for use on such trucks. All other uses of rubber in the manufacture or assembly of these trucks is prohibited.

Exceptions are granted where the use of rubber tires is necessary to prevent explosion hazards, and to avoid accidents in the handling of explosives, damage in transporting unbaked grinding wheels or green foundry cores, or, damage to delicate instruments which are an integral part of the truck.

Distillers' High Wine Output to War

BEVERAGE alcohol distilleries must devote 75 days' output of high wines in the remainder of 1942 to meet war requirements for industrial alcohol, they were told May 4, by the WPB.

Commercial Gas Users Exempt from Rationing

ALL commercial and governmental users of gasoline are exempt from the card rationing plan inaugurated May 15, in 17 Eastern States by the OPA.

However, all such gasoline users who are subject to recent orders of the Office of Defense Transportation providing for the elimination of all luxury or nonessential services must comply with the ODT regulations.

Chrome Steel Limited to A-1-k

FURTHER restriction on the use of chrome steel was ordered March 27 by the WPB in Amendment No. 1 to Supplementary Order M-21-d. The new restriction limits the use of steel containing 4 per cent or more of chromium to ratings of A-1-k or higher. The original order, issued December 27, 1941, permitted deliveries of 4 per cent chrome steel on ratings of A-10 or higher.

The PRACTICAL ENGINEER *and* ELECTRICIAN

RICHARD H. MORRIS, EDITOR

BLACKOUT LIGHTS—BLUE OR RED?

Air raid sirens wail from coast to coast. While we hope they may be needed for naught but practice we must face the fact that real raids are possible, and, no more fantastic than submarines in the St. Lawrence and Mississippi Rivers.

Faced with blackout requirements for the plant, some engineers have been able to use mechanical means, i.e., complete coverage of all building windows and openings. Others less fortunate have had to provide some means of turning the lights out completely or reducing the lighting level to the point where it can be seen only a short distance.

Through rather indefinite rumors, blue was heretofore generally considered the proper color to use for these emergency lights—blue according to rumor being the least visible color, and thus the hardest to see and the safest to use. This color theory was supported by the use of blue in the British Navy for signal lights and markers as well as the blue flashlights used by British fire wardens.

Army engineers, as a result of extensive tests and research, contradict this. It is true that when close, the eye sees red better than blue (i.e. blue is least noticeable). However, from a distance, as an aviator would be, the eye is so constructed that the blue is much more noticeable than red, hence the blue is more dangerous.

Spotters at 5000 ft. elevation saw blue flashlights where red ones almost alongside were completely invisible and the red light had to have many times the intensity of the blue before being noticeable. It is said observers could spot a man lighting a cigarette for miles but could not see the red glow of the cigarette after the match was extinguished.

The light best seen by those on the ground without being detected at 5000 ft. altitude was red or orange red. As a result the OCD is recommending that red or orange-red emergency lamps, and flashlights, be used instead of blue.

Red or deep orange light is not as useful for illumination as white, but it is much superior to blue for nearby seeing with the added advantage of being less visible from the air.

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A Section of Power Plant Engineering Devoted to
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For Amateur Inventors Only

Your Invention and How to Protect It is a theme that has been harped on for years, both by quacks, as a blind to draw in suckers, and by honest men and lawyers in an endeavor to drive the unscrupulous out of business. Practically all engineers are by nature rabid inventors, sometimes with a number of simple but unpatented inventions in practical use and at least one World Beater tucked away in the attic or workshop. Not all inventions are patentable, many are not worth patenting and some inventors do not bother with a patent. Nevertheless, large sums are spent each year for this purpose and many of these patents, whether the invention is good or bad, are worthless should they ever be taken into court. For this reason we asked the author to prepare this article as a simple explanation of the steps that must be taken if the inventor wishes to have his invention protected from a legal standpoint. He is an engineer and was for many years Associate Editor of Power Plant Engineering. As a technical consultant he became interested in the study of patent law.

By J. R. DARNELL

RECENTLY an article in a popular magazine advocated "Protection Without Patents" by advancing the bizarre idea that a secret written description and sketch of an invention will give full protection to an inventor. This is pure bunk and may cause trouble for some poor but deserving inventor who may wish to cash in on his invention.

It was suggested that after an inventor had made a written description and sketch of his invention that he fold and seal the papers, write his signature and date on the outside and then have a notary witness this signature. Next, he must place this document in an envelope, send it by registered letter to himself and then keep it unopened until needed in court.

Referring to this procedure the article said: "It definitely establishes the date on which you conceived the idea and then all you have to do is to prove that you worked on the development more or less continuously from that date until such time as you file suit against any one else who attempts to patent the idea."

This quotation reveals the grossly erroneous reasoning of the author. If an inventor wishes to make use of his invention only in his own plant or office and was not concerned whether or not competitors might use the idea, he might protect himself from a charge of infringement by someone who might later patent the idea. By disclosing in court the secret written description he might convince some court that he, and not the patentee, was the first inventor.

Such disclosure would then invalidate the patent and preclude any finding of infringement by the court as it is obvious that no one can infringe the claims of an invalid patent.

However, an inventor who writes out a description of his invention, then files it away and waits until someone else gets a patent for the same idea may be charged with a lack of diligence which will be fatal to his claim that he is the first inventor. The law on this point is well established as pointed out by a court in a case which has been consistently followed by other courts. The court said:

"The law appears to be well established that a conception evidenced by disclosure, drawings, and even a model, confers no rights upon an inventor unless followed by some other act, such as actual reduction to practice, or filing an application for a patent. A conception of this character is not a complete invention under the patent laws. It may constitute an invention in a popular sense, but it does not make the inventor the 'original and first inventor' under the statutes.

"If it did constitute an invention under the statutes, then an inventor might stop with his drawings and disclosure, and hold the field for all time against a subsequent inventor who has reduced his invention to practice, or who has obtained a patent.

"The law will not permit this. An inventor must not stop with this stage of his invention, but he must proceed with reasonable diligence to perfect his invention, either by actual reduction to practice, or by filing his application for a patent.

"This rule of the patent law is both reasonable and just. It secures to the first conceiver the right to his invention. It is not uncommon for two persons to conceive an improvement in an existing device about the same time, and all the law exacts of the first conceiver in order to protect him in his right to the invention is that he shall proceed with reasonable diligence to reduce the invention to practice, or to file an application for a patent in conformity with the statutes.

"The authorities seem to be conclusive upon the point that a conception evidenced by disclosure and drawings does not constitute an invention under the patent laws. . . .

"We understand the true rule to be that a patentee who undertakes to carry back the date of his invention to his drawings and disclosure must show reasonable diligence in adapting and perfecting his invention, either by actual reduction to practice or by filing his application. . . ."

Another court, following this same rule said: ". . . Knowledge of the entry of the rival in the field is not necessary in order to impose the duty of diligence. The policy of the patent law does that in the public interest. Effective diligence must commence upon conception—before the rival inventor enters the field—and must continue thereafter. . . ."

A patent is a grant given by the Government to an inventor to exclude others for a period of 17 yr. from using his apparatus or process. Anyone who does so without a license from the inventor or the owner of the patent, infringes. On the other hand, no matter how meritorious an idea may be, if the so-called inventor does not obtain a patent he has no standing in court and cannot, as stated in the above quotation, "file suit against anyone else who attempts to patent the idea."

Even the act of filing an application does not give the inventor right to exclude others. He must first have been given his patent grant by the United States Commissioner of Patents before he has any legal rights to sue anyone for using his invention without his permission.

Furthermore, the so-called inventor who has a secret written description of his invention and who makes no attempt to file an application in the Patent Office cannot possibly be in a position to have any official knowledge of anyone else attempting to patent the idea. Any other person who might conceive the same idea could file an application in the Patent Office and the public would not be aware of such application until the claims which the inventor presented had been allowed and the patent had issued. All applications are held strictly secret by the Patent Office.

Even after a patent has been granted a patentee cannot "file suit against anyone else who attempts to patent the idea." Suit can be brought only for an act of infringement. In many instances, however, there are two or more applications on file in which the same subject matter is claimed, or there may be applications on file claiming the same subject matter already claimed in a patent issued less than 2 yr. previously.

Whenever this occurs the Patent Office notifies each of the parties of this condition and declares that an "Interference" exists. The primary purpose of such Interference proceedings is to determine the first inventor. Each party is required to file an affidavit stating his date of conception, first written description, first disclosure to others and first reduction to practice. By the latter term is meant the reduction of the invention to a fixed, positive and practical form.

In other words, for example, if the idea involved an apparatus the inventor must state when he first built and operated such apparatus. Interference proceedings usually are very long drawn out and costly and only a few private in-

ventors can afford to carry such proceedings through all of the tribunals of the Patent Office.

Many inventors unwittingly invite Interference proceedings by marking manufactured articles with the terms: "Pat. Pending" or "Patent Applied For." Such markings have no legal significance and may invite a competitor to file an application for a patent covering the same device. The Patent Office will then declare an Interference which may last for years.

In the meantime anyone can manufacture and sell the device with impunity. The writer has been intimately associated with three Interference proceedings which began in 1930 and which only recently came to final hearing before the United States Court of Customs and Patent Appeals.

If an inventor has an idea which he believes is patentable he should immediately make a sketch which will disclose a workable form of the idea, write out a description and then sign and date the papers. Next he should carefully explain the invention to one or more friends and then have them sign the papers and date them.

Witnessing by a notary is not necessary. The purpose of such procedure does not afford the inventor any protection unless he files an application but may be invaluable if his application should be thrown into interference with another application or with a patent issued less than 2 yr. previously.

It is not necessary for an inventor to have actually reduced his invention to practice, either before or after filing his application since the courts have held that the filing of the application is considered as "constructive reduction to practice." However, actually building the device, no matter how crude it may be at first, may have an important bearing on obtaining strong claims when the patent issues.

Another important point in patent law of which many inventors are ignorant is that after having built a workable device the inventor must not delay in filing his application. The law at present allows an inventor a period of 1 yr. in which to perfect his invention if before filing his application he chooses to publicly experiment with it.

If the experiments are made in secret, the inventor must swear to secrecy everyone who sees the device. The so-called Public Use Statute provides, among other things, that a patent is invalid where the invention has been "in public use or on sale in this country for more than 1 yr. prior to his application." In view of this statute, the courts have established the following rules:

1. An inventor has a reasonable time in which to experiment for the purpose of perfecting the invention and demonstrating its utility.

2. The time thus spent, if in good faith, is no part of the 1 yr. statute of limitations.

3. The experiments must be made in perfecting the invention as described and shown.

4. Experiments made in testing parts of the machine not covered by the invention will not have the effect of extending the 1 yr. period.

5. As soon as the invention is completed, viz.: "in such a condition that the inventor can apply for a patent for it," the 1-yr. period begins to run and the application must be made within this period.

6. The fact that the invention has been proved since its original embodiment does not demonstrate that it was then embryonic or incomplete.

7. When a clear case of prior public use is established the burden is on the inventor to prove by convincing proof that the use was experimental.

If you have an idea for a device or process which is new, useful, and which is something more than a mechanic skilled in the art could produce, you probably have an invention. To fully protect your invention you should take the following steps:

1. Write out a description and sketch and have it witnessed as previously described.

2. Have a search made in the Patent Office to learn whether someone else has invented the same thing or something so closely resembling it that an attempt to obtain a patent would be futile. A reliable patent attorney or someone thoroughly familiar with the procedure should make the search.

3. If the search discloses nothing clearly anticipating your idea and if you have the funds, it is always advisable to build a working model or even full-sized apparatus, if the latter is not too expensive. You may publicly experiment with this apparatus, but you must file your application within the statutory time limit of 1 yr. Experiments will furnish data to enable your attorney to write a clearer specification and formulate better claims than he could otherwise do.

4. If you cannot afford to build a working model, then file your application immediately after you have written out your description. In this case it may not be worthwhile to spend any money for a search. A search to be of any value at all will cost at least $25. For $30, plus whatever your attorney's fee may be, you can file your application in the Patent Office.

5. If you start manufacture and sale of any device embodying your invention while an application is pending, do not notify your competitors that you have filed an application by marking the article with "Pat. Pending" or "Patent Applied For."

6. After the patent is granted be sure

"Okay, Jones will see YOU now!"

that the public is notified by marking the article with the notation: "U. S. Patent No. ————."

7. If another party has a financial interest in your invention, never assign to him as an individual any fraction of your interest in the invention. His financial interest as well as yours should be protected by the formation of a company to which the patent should be assigned. Anyone to whom any fraction of an invention has been assigned may sell his part of the patent or license others to use the whole patent just as if he were the sole owner. The patent laws do not recognize any fractional parts of a patent.

8. If you find someone is infringing your patent, proceed with caution. Try to settle out of court even if you recover only a fraction of what you estimate you might receive through successful litigation. Even after a Federal District Court finds a patent infringed, and this finding has been affirmed by the Appellate Court, the accounting proceedings to compute the damages may last for years. A suit which was filed in 1926 was still undergoing accounting proceedings in 1938 and another filed in 1928 was not finally settled until last year.

9. In any procedure involving a patent, whether before or after the patent issues, retain a competent patent attorney. Home remedies may be cheaper but often fatal.

FOR THE PLANT ELECTRICIAN

Dynamic Braking Pays Dividends

Dynamic braking, obtained by operating a motor as a generator, has a number of practical industrial applications and is now an essential feature on modern street cars and Diesel-electric buses. It has practically eliminated wheel heating from friction brakes with the result that mileage between wheel grindings increased from 20,000 to 40,000; wheel life increased from 140,000 to 200,000 mi.; brake shoes last 15 times as long; and brake inspection periods increased to as much as 10,000 mi.

By W. J. CLARDY*

OPERATION of traction motors as series generator for dynamic braking is now generally accepted and in the transit field has been applied to some 600 vehicles. The standard equipment for modern trolley cars consists of four 300-v. motors run two in series on 600 v. Dynamic or motor braking requires an arrangement of connections which will permit operation as generators. There must be an equal division of braking load among the motors on a car to secure satisfactory results. This is accomplished by cross-connecting so that the fields of one pair of motors are excited by the current generated by the armatures of the other pair of motors.

Since two 300-v. motors are connected in series they really function as a single 600-v. machine. A spotting system, which pre-selects the correct braking resistance corresponding to the car speed, causes actuation of the electric brake quickly and smoothly when the pedal is depressed. The circuits for spotting are closed prior to the loss of the power current residual magnetism in the motor fields to secure a prompt build-up of the very low braking or spotting current. The electric brake is constantly available for instant application when the operator so desires and may be used independent of the air brake.

*Transportation Application Engineer, Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

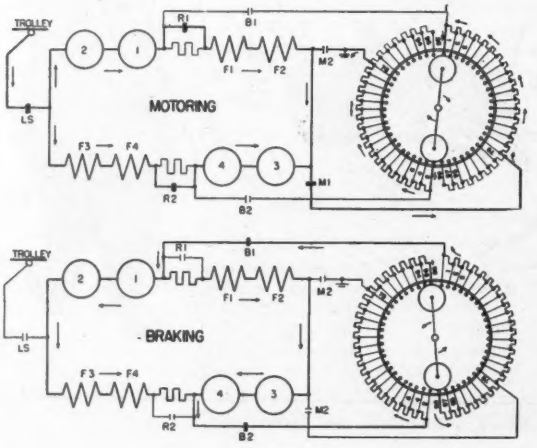


Fig. 1. Simplified main circuit diagram showing parallel accelerator control

Rapid Transit and Street Cars

The simplified main circuit diagram in Fig. 1 shows the fundamental connections. During motoring the current flows from the trolley through the line switch LS and then divides between two parallel circuits. One circuit includes No. 1 and 2 motor armatures, the R-1 switch (which is closed to bypass the R-1 permanent braking resistor), and No. 1 and 2 motor fields. The other circuit is the same and is applicable to No. 3 and 4 motors. The current from the two parallel circuits then passes through the switch M-1, the accelerator resistors between positions 79 and 1, and between positions 2 and 78, and thence to ground.

When the power circuit is opened and the proper dynamic braking connections are established the current flows from right to left through No. 1 and 2 motor armatures (which is the reverse of motoring) through No. 3 and 4 fields (the same as when motoring), the R-2 permanent braking resistor, the B-2 switch, accelerator resistors 2 to 98 and 99 to 1 and the B-1 switch to No. 1 motor armature. Current also flows from motor armatures No. 3 and 4 through switch B-2, and R-1 permanent braking resistor, fields No. 1 and 2 to motor armature No. 3.

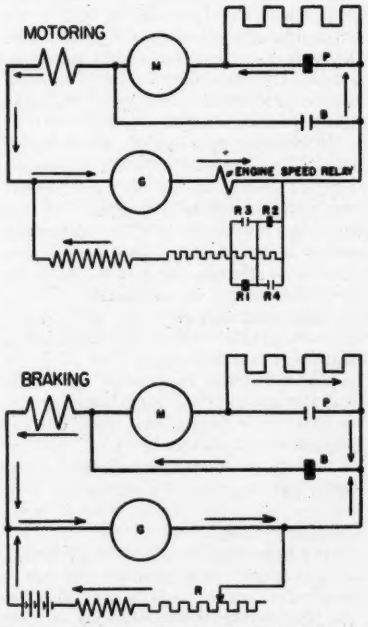


Fig. 2. Diagram showing fundamental circuit for gasoline or Diesel engine bus with dynamic braking

The modern Diesel-electric bus has a single series motor and is equipped for dynamic braking. A switch is provided in conjunction with the air brake mechanism to establish the necessary braking circuits. The propulsion motor functions as a separately excited generator and is loaded by means of a resistor. The amount of resistance is adjusted to secure the desired braking effort. When the

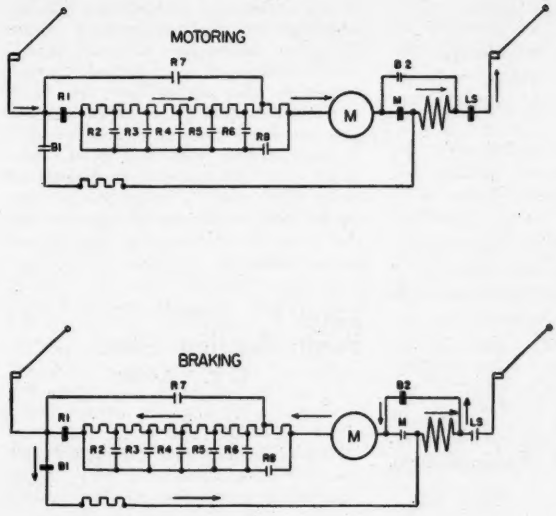


Fig. 3. Diagram showing fundamental circuit for single motor trolley coach with dynamic braking

brake pedal is depressed the dynamic brake is applied in two stages in advance of the air. Motor field excitation from the battery and main generator assures prompt response. The dynamic brake may be used independently of the air when desired by the operator.

Diesel Electric Buses

A main circuit schematic diagram of the connections appears in Fig. 2. During motoring an accelerator switch closes the battery circuit to the generator shunt field where the accelerator pedal is depressed. This initial excitation from the battery insures a rapid build up of generator voltage. A potential relay interrupts the battery circuit when a predetermined generated voltage is attained. Current flows from the generator armature through the engine speed control relay series coil, the switch P, the motor armature, the motor field and back to the generator armature. Also, current passes from the generator armature through the engine speed control relay series coil, the generator shunt field resistor, the generator shunt field and thence back to the generator armature.

A portion of the resistor in series with the generator shunt field is in the circuit permanently and a portion is inserted by the engine speed control relay which automatically regulates the closing of switches R-1, R-2, R-3 and R-4. The switches R-1 and R-2 are normally closed at low currents while R-3 and R-4 are open. With an increase in current R-1 and R-2 insert a fixed value of resistance in the field circuit in 2 steps. The resistance is cut-out in 2 steps at high currents by switches R-3 and R-4. The permanent section is adjusted to provide the best engine performance under normal conditions. When heavy loads occur the insertion of additional resistance weakens the generator field thus permitting the generator to operate at higher speed and deliver greater horsepower.

When the brake pedal is depressed an effective electric brake is applied in two stages in advance of the applications of the air. During dynamic braking current flows from the generator armature through the switch B, the motor field and back to the generator armature. Another current path is from the battery through the generator armature, the adjustable generator shunt field resistor, the generator shunt field, and returning to the battery. The engine operates at idling speed during dynamic braking and the battery excites the generator field. Since the motor series field is separately excited by the generator, current flows from motor armature through the braking resistor, the switch B, and back to the motor armature.

The single motor trolley coach with dynamic braking has now become a standard. Excitation is provided for the field of the propulsion motor and it functions as a series generator. A resistor is connected across the armature and current flows which acts as a brake on the motor. When there is no separate series field excitation the armature current serves this purpose. The direction is opposite to that of the motoring current. In order to maintain the same excitation of the field its connections must be reversed relative to the armature during braking. The current in the field is in the same direction as during acceleration to benefit from the residual magnetism of the frame. A small amount of excitation from the line is used to assist in obtaining a rapid build-up.

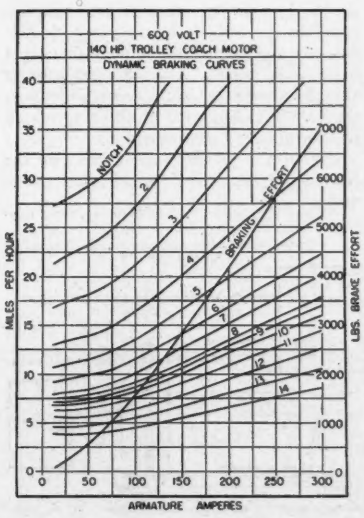


Fig. 4. 600 v. 140 hp. trolley coach motor dynamic braking curves

Trolley Coaches

A schematic diagram of the main circuit connections is shown in Fig. 3. During motoring the current first flows from the trolley at the left, through the switch R-1, the series resistance, the motor armature, the switch M, the motor field, the switch LS, and thence to the trolley at the right. The series resistance is then cut-out by closing switches R-2, R-3, R-4, R-6 and R-7, successively, after switch R-7 and R-6 are opened, followed by the closing of switch R-8. This parallels the series resistance between R-1 and R-7 with that between R-7 and R-8.

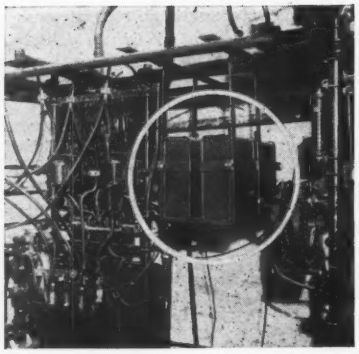
The paralleled series resistance is cut-out by closing switches R-1, the switch B-1, the permanent braking resistor, the motor field (same direction as motoring), the switch B-2, and returning to the motor armature. The series resistance is then cut-out by closing switches R-2, R-3, R-4, R-5, R-6 and R-7, successively. After switch R-7 closes, switches R-1, R-2, R-3, R-4, R-5, and R-6 are opened, followed by the closing of switch R-8. This parallels the series resistance between R-1 and R-7 with that between R-7 and R-8.

The paralleled series resistance is cut-out by closing switches R-2, R-3, R-4, R-5, R-6, and R-1 in the order listed. The motor is then operating at its minimum and dynamic braking speed with the permanent braking resistance in the circuit.

In order to speed up the dynamic brake application as many switches in the braking circuit as possible are closed when the power pedal is returned to the off position. This gives immediate response with the first movement of the brake pedal. The first half of the total brake pedal travel controls the application while the remainder is for the air. Braking is fully automatic under the control of a current limit relay which assures maintaining the selected rate. Typical notching curves for the dynamic brake appear in Fig. 4.

Capacitors Boost Load Conditions

CAPACITORS are being used by the R. D. Cole Mfg. Co. metal-working plant at Newman, Ga., to save power and to improve voltage regulation of the company's group and individual a.c. motors. The G.E. Pyranol capacitors have ratings of 60 kv-a, 30 kv-a, and 15 kv-a, and are installed on large motor terminals and at load centers on the plant's power feeders.



Two 15 kv-a. capacitor units on the circuit of a 75-hp. induction motor during a d.c. generator for crane operation. Note the ceiling type hanger.

Units used at the load centers have been connected to enclosed fusible knife switches, while the capacitors on the large motor terminals are in operation only when the motors are running. Before the installation the power-factor of the plant had a value of approximately 50 per cent.

This was due to variation in the load brought on by electric welding, and to magnetizing current far in excess of the working current. Power furnished by the power company was 550 v., 3-ph., 60 cy. A special rate was available for load power factor averaging above 90 per cent during a 30-da. period.

Installation of the capacitors, adjusted to keep the power-factor above 90 per cent, has brought about a definite improvement in the efficiency of the electric power system and a substantial reduction in the R. D. Cole Mfg. Co. power costs.

HINTS AND KINKS

Safeguard for Turbines When the Vacuum Fails

By S. H. COLEMAN

INDUSTRIAL bleeder condensing turbines designed for the constant pressure extraction of process or heating steam, require special handling when abnormal operating conditions develop. Of special importance is the need of adequately safeguarding the low-pressure stages of the machine against the possibility of overheating in the event the condenser vacuum is lost and the unit must be exhausted to atmosphere.

Extraction turbines are ordinarily so constructed that when the extraction stage sectionalizing valve gear is in the completely closed position (indicating that all of the load on the machine is being taken care of by the stages between the main throttle and the extraction nozzle) a small quantity of steam will be bypassed into the remaining stages of the unit. This bypassed steam serves as a cooling medium and prevents overheating which might otherwise be caused by windage set up by the rapidly revolving blades.

This quantity of steam, bypassing the closed extraction stage sectionalizing valve gear, is usually sufficient to properly cool the low-pressure blading only when normal vacuum exists in the condenser. Should a vacuum failure occur, the pressure drop across the bypass orifice or orifices will be greatly decreased reducing the quantity of steam available for cooling the blading.

Under such an operating condition not only will the volume of steam be reduced but it will have a very high temperature due to the pressure being above that corresponding to the atmosphere. In addition to these items tending to lower cooling efficiency, there will also be a substantial rise in the windage frictional heat developed due to the increased density of the steam in which the low-pressure wheels revolve. All of these factors together may contribute to a rapid rise in temperature which may result in serious distortion of the casing and warping of the spindle.

For these reasons it is always advisable to provide a means of blocking the extraction valve gear open in event of condenser vacuum failure. This procedure will allow sufficient steam to pass through the low-pressure blading to counteract any tendency toward an excessive temperature rise. Incidentally, operators should be instructed to immediately block open the extraction valve gear whenever the vacuum is lost.

Simple Compound Feeder

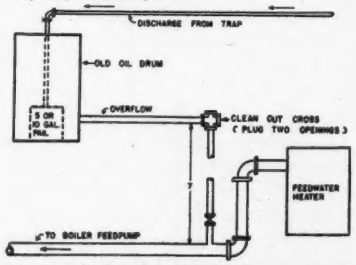
By GEORGE L. KIRK*

MANY BOILER compound feeders are arranged so that compound is fed to the boilers in one shot and it is quite possible for one boiler to get a double dose of the compound while others get little or none. The accompanying sketch shows a simple arrangement that we have built from old parts which we found very successful.

With this arrangement we put the compound into the 5 gal. bucket every 12 hr. When the trap dumps the pail overflows and the compound is fed to the pump suction line in small quantities so that it gives an almost continuous feed. No matter how the feed-valves on the boiler are set, each boiler gets the same amount of compound.

Our success with this device may be gaged by the fact that we wash each boiler but once a year, during the period that they are off the line for the State Inspection, and we do not turbine tubes at all.

*Chief Engineer, Water Works Pump Station, City of Lima, Ohio.



Compound placed in the 5 gal. can is overflowed by the trap discharge to the larger tank and to the pump suction and is fed to all boilers in the proper proportion

Long vs. Short Pump Suction Lines

By C. T. BAKER

SOME YEARS ago, the capacity of a city-owned light and water plant was increased by the addition of two 800-hp., 550 kv-a. capacity Diesel electric generating units. This new generating capacity called for the installation of additional jacket cooling water supply. To be on the safe side, two new 750 g.p.m., 75-ft. head pumping units were installed which would allow one unit to remain idle as insurance against breakdown.

A small brick structure was erected at the lake from which the water supply was to be taken, to house the pumping equipment. Now the question of suction lines came up for decision. The plant chief engineer recommended the installation of a concrete suction well at the lake with a large, properly screened intake pipe extending from the suction well out into the lake to a point of permanent deep water.

By this plan a short and direct suction line could be run from the suction well to each pump thereby making a very simple and workable layout and one that would be free of trouble. This suggested plan was, however, overruled by the "City Fathers" and the engineer was instructed to extend a suction line from each pump out into the lake, with the lines supported on concrete piers, the tops of which were to be finished about 3 ft. above the water level.

To insure that the end of these lines would be properly submerged during periods of low water at certain seasons of the year, it was necessary to run the pipe quite a distance from the pump house. This distance plus the vertical lift and the necessary elbows used between the foot valve and pump was equivalent to 200 ft.

The loss in head, due to friction, per 100 ft. of smooth wrought iron pipe is shown by the friction tables to be 5 ft. Since there was a total of 200 ft. of pipe and elbows this meant a loss in head of 10 ft. The velocity of a 750 g.p.m. flow through a 6-in. pipe is 8.5 f.p.s. or 510 f.p.m., a figure about twice that considered as good practice.

Had an 8-in. suction pipe been installed to each pump rather than a 6-in. line, the velocity would have been reduced to 288 f.p.m. and a corresponding reduction in loss of head from 5 ft. to 1.75 ft. per 100 ft. length of pipe.

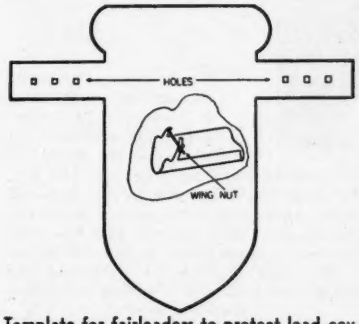
Trouble has always been experienced whenever it has been necessary to start an idle pump since it requires from 1 to 2 hr. as a general rule to clear the long suction pipe of air and get the pump to pick up suction, notwithstanding that each pump is provided with a priming connection supplied with city water.

To permanently correct the many operating troubles experienced with this installation, a large concrete suction well will shortly be located near the pump house and the pumps connected to it with separate 8-in. suction lines. In addition to this change, the pumps will be equipped with automatic primers that will maintain the suction lines and pumps free of air and full of water at all times.

Fairleaders for Cable Protection

By P. C. ZIEMKE

Power and communication cables that radiate from power houses to various outside load centers most frequently are placed in manholes and ducts for efficient and economical operation. Usually these cables are protected by only the thin and soft covering of lead which may easily become damaged through rough installation methods or by movement of the cable after installation.



Template for fairleaders to protect lead covered cable and sketch showing how it is bent so as to fit snugly

Occasionally galvanic action is established between dissimilar metals and is highly destructive to cable life. Then too the crushing weight of large cables tends to flatten out the lower portion of the lead sheath or the lead is seriously scoured by the slight though apparent movement of the conductors due to load stresses.

A very serviceable cable protector can easily be fashioned by the engineer of material obtainable about the shop. We cut ours from scrap aluminum or zinc stock according to attached pattern. This material must be at least ⅛ in. thick for long wearing qualities and the through bolts that bind the fairleader to the cable must either be galvanized or cadmium plated to resist underground moisture.

We have found it good practice to install these leaders in the duct ends prior to pulling in cable then tighten them firmly in place when pulling operations have been completed.

Changing Stroke Cures Pump Trouble

By G. L. RADAMAKER

Trouble was experienced with a belt driven single acting reciprocating piston type pump used for delivering a solution of lime, soda ash and aluminate to a settling tank for hot lime and soda treatment of boiler feedwater.

Several times the pump became steam bound, as the temperature of the mixture and make-up to this pump was about 205 deg. F., and leaks developed past the packing in the gland of the pump. Tightening the packing did not help.

The pump was shut down, inspected, and found to have a crack in the piston, but this was not serious enough to warrant immediate repair. The pump was repacked. Ball checks were inspected and found to have only slight leakage. The stroke of the pump was lengthened, but this only aggravated the trouble. More trouble was experienced with the packing.

The pump was shut down, repacked, and this time the stroke shortened from 2½ in. to ¾ in. It was found that more make-up water was being handled by the pump and operation in every respect was improved. With the shorter stroke the life of the packing was very much increased.

Hospital Engineer Operates on a P. R. Valve

By H. P. STORER

In a small local hospital a forced circulation hot water heating system is used with the water heated in a U-tube heater with exhaust steam from the feedpump and the 5 hp. turbine driven hot water circulating pump. Room temperature is maintained by increasing the temperature of the circulating hot water as the outside temperature drops and vice versa.

At temperatures below freezing the exhaust steam was insufficient and it became necessary to add live steam to exhaust line through a reducing valve. This 4 in. reducing valve had a small diaphram intended for a pressure range from 100 to 15 lb. It proved to be most unreliable and unsatisfactory to reduce the pressure from 100 to 1 lb. or less.

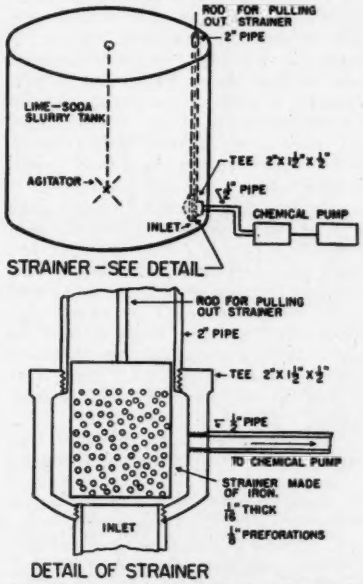
As the cost of a new reducing valve for this infrequent service was considered prohibitive, the problem was solved in the following manner:

Two blank flanges 18 by 1½ in. were found in a junk yard, purchased at the pound rate, and were machined as shown in the sketch. After assembling to replace the original diaphram the valve operated with a back pressure of less than 1 lb. The reducing valve has been in operation for several years and has given no trouble.

Slurry Tank Strainer

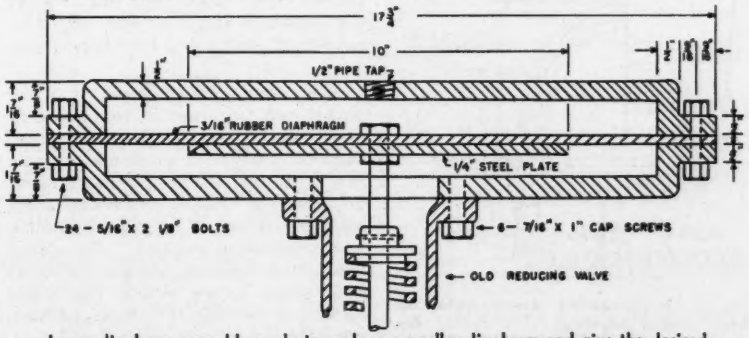
By G. F. SUCHY

From time to time in the past we had difficulty with our chemical feed system. The drawing shows my design of a strainer for use in the suction line of the small chemical pump used for pumping the lime slurry for treating the boiler feed make-up. In some cases when lime is stored a long time it acquires some crumbs which do not dissolve. To prevent this continuous clogging of the suction line between the slurry tank and the pump this strainer was installed.



Lime slurry tank and detail of strainer built to eliminate clogging of the chemical pumps suction line

It can be conveniently removed for cleaning at any time before the tank is empty. We experienced no more clogging with crumbs or other particles since it was installed.



Large diaphram assembly made to replace a smaller diaphram and give the desired pressure control

A Circulating Blowoff System That Works

By R. O. Barnhart*

DISCUSSION of a circulating blowoff arrangement that did not work[1] is evidence that an engineer should never be satisfied with halfway information and advice but should always make a thorough investigation before proceeding with some arrangement out of the ordinary. The particular arrangement discussed, and shown by the dotted lines of Fig. 1, is fundamentally the same as a water column connection.

There is no question but that evaporation of water in the blowoff pipe will deposit an excessive amount of scale and eventually result in burning out of the pipe. Yet I know that properly installed a circulating blowoff arrangement will work. In this plant we have two 150-hp. H.r.t. boilers, both bought second hand and coated quite heavily with scale.

Returns to the boiler room are high and we have only about a 10 per cent make-up. This is Zeolite softened and there is, therefore, little or no new scale to contend with. After a short while the old scale did loosen and this loose scale, coming down packed so tightly behind the angle bars that hold the stay rods to the back head, that it had to be dug out with packing hooks.

As the boilers carry 150 per cent rating during the morning and evening hours of the heating season, I was worried about the burning of the shell at that point and took the matter up with our boiler inspector. (They are really swell fellows to go to with boiler troubles.)

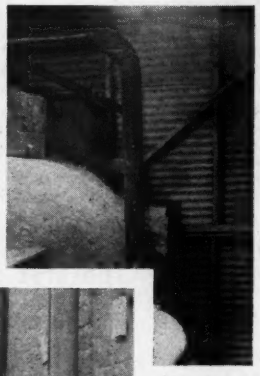
Upon the inspector's recommendation, the connections, shown in Fig. 2, were made. Briefly this consists of: a 2½ by 2½ by 1½ in. tee, just ahead of the blowoff valves; from this tee a 1½ in. pipe is carried up over the rear arch, with an easy bend, and through the rear head, as shown by the photographs; inside the boiler the line is carried to the center of the boiler and down below the water line, as shown by the photograph inside the shell.

The check valve, shown just before the 1½ in. line enters the boiler was not included in our original installation, made in July, 1935. Apparently the original installation worked all right until December 28, 1938, when the blowoff pipe burned out.

The whole crew agreed that the boiler had, apparently, been blowing down normally. It was reasoned, therefore, that a large chunk of scale had fallen on, or, in, the main blowoff pipe and smaller ones had accumulated around it till the circulation was completely stopped. This went undetected, however, because when the boiler was blown down, the water backed up through the 1½ in. circulating pipe.

A new blowoff was installed and this time a check valve[2] with disc was put in the line. In the 2½ yr. since, careful inspection of the blowoff pipe externally, and with a flash light internally, discloses no signs of burning, even though the blowoff pipe is unprotected by any means other than the circulation. Should the main blowoff again become clogged with scale, the man blowing down will be able to discover it immediately by the absence of blowdown water.

Figure 3, taken right after opening the boiler, shows scale scattered along the bottom of the boiler, but the angle bars are clear and no longer do we have to crawl to the back end to dig the scale out from behind them.



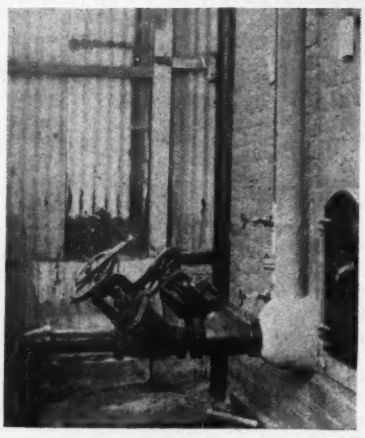


Fig. 2. Three photographs showing the installation at Livermore Sanitarium. Left, the blowoff valves at the rear of the boiler with the circulating line going upward. Left top, the circulating line coming up the back wall of the boiler enters the rear of the drum, and the check valve prevents back flow when the boiler is blown down. Above, inside view of the boiler showing the circulating line turned downward and extending well below the water level

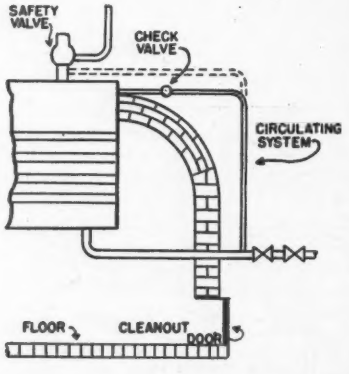


Fig. 1. This circulating blowoff system has been proven practical. The dotted line shows the unsuccessful system as discussed in Question No. 125[1]

* * *

Removing ammonia from parts of the system can best be done safely by means of hot water. This will not cause excessive pressures or temperatures. A blow torch should not be used for this purpose. The sections should not be heated while under pressure, however, for the combination of pressure and temperature may cause strains and breakage. A stainless steel coil in a brewery was thus cracked along a fin by washing the outside with hot water while the coil was under pressure.

*Chief Engineer, Livermore Sanitarium, Livermore, California.

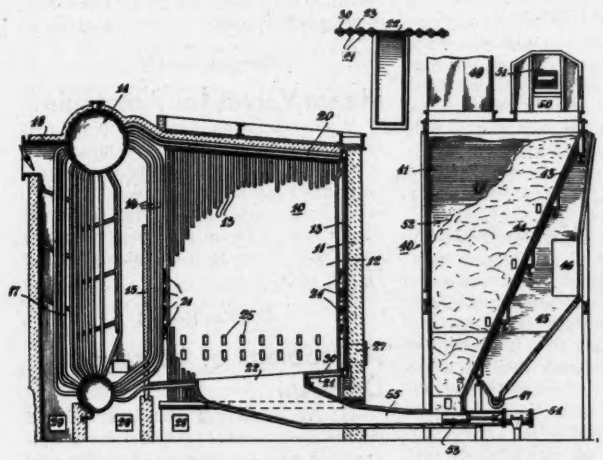
[1]Circulating blowoff systems were soundly criticized in a discussion following the publication of Question No. 125 on page 92 of the August issue. A system shown by the dotted lines of Fig. 1 of this article was installed by C. W. Z. on a new 285-hp. H.r.t. boiler. Trouble was encountered almost immediately from scaling and burning of the blowoff between the boiler and back wall. Discussion of the problem was printed on: pp. 98 and 99 in December; p. 100 in January; p. 98 in February; pp. 94 and 95 in March; and p. 79 in June.

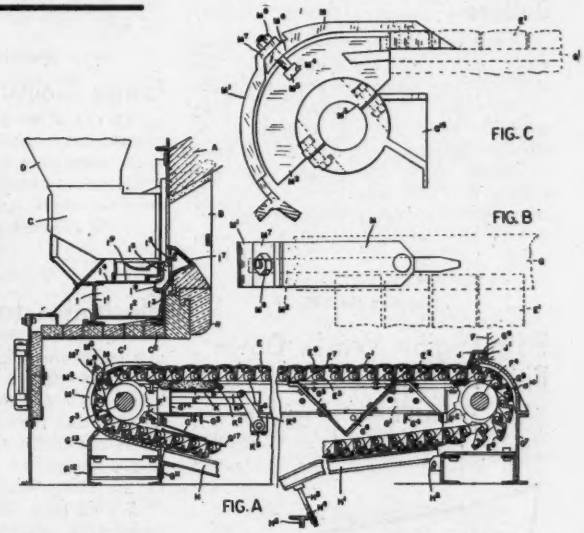
[2]This was a Crane 300 lb. check with a regrindable disc. The author says that close observation, by means of a pencil held in the teeth, indicates that normally water passes through the check continuously and the disc cannot be detected touching the seat.

RECENT PATENTS
For Power Plant Apparatus

Copies of patents may be obtained from the Commissioner of Patents, Washington, D. C. Give the patent number, patent title and inventor's name. All patents are 10 ct. a copy payable in coin or money order. To facilitate purchase, coupon books (each coupon good for one patent) may be purchased; 20 coupons for $2; or 100 coupons for $10

Compiled by J. R. Darnell





2,276,659. Wet Refuse Furnace and System. Henry Kreisinger, Piermont, N. Y., assignor to Combustion Engineering Co., Inc., New York, N. Y.

This invention relates to a method of efficiently burning wet wood refuse fuel in a water-cooled furnace. In prior methods the temperature of combustion was maintained by refractory walls but lack of close control for the air and fuel supply caused high excess air, smoky chimneys and loss of unburned fuel through the furnace off-take.

As shown at the right of the drawing, wet refuse is introduced through opening 50 and as it falls down over drier plates 43 is dried by hot flue gas which is recirculated to chamber 45, then passes through ports 44 and out through stack 48. The dried fuel at the bottom of the drier is forced into the furnace 10 by ram 53. The floor of the furnace is made up of boiler tubes 21 covered with metallic blocks 30 with one or more openings 22 between to provide for admission of the fuel. Hot air from an air pre-heater is forced through apertures 23.

The forward stroke of the ram causing the fuel to be pushed upwardly, agitates the conical pile in the furnace and causes some of the burning fuel to roll down the sloping sides. This method of feeding prevents the smaller particles from being carried in suspension in the gases and thus lost up the chimney.

2,271,967. Stoker. R. L. Beers, Birmingham, Mich., assignor to Detroit Stoker Co., Monroe, Mich.

In the combination of a sprinkler type fuel feeding mechanism and a horizontal traveling grate stoker, this invention relates to features of the construction including: first, the means for supporting and cooling the fuel feeding mechanism and for simultaneously supplying over-fire air to the furnace; second, in the peculiar construction of the traveling chain grate; third, in the means for taking up slack due to wear and stretch in the chain; fourth, in the construction of an adjustable air seal for regulating the distribution of air through the grate.

The sprinkler mechanism located in casing C, to the left of the drawing is not shown. Air used to cool the hollow beam I, which supports the sprinkler mechanism, also supplies over-fire draft through posts I^7.

To compensate for the slack caused by stretch in the links and wear in the pivotal connections stationary rails H are arranged at an inclination beneath the forward part of the return portion of the chain grate, and adjustable rails H′ pivoted at H^2 are arranged beneath the rear portion thereof. Links H^3, each having a threaded portion engaged by nuts H^4 on opposite sides of an apertured bearing H^5, serve as a means for lowering the rails H^1 and changing the inclination thereof.

Regulation of the amount of air that passes upward through the grate bars is accomplished by means of a sliding seal. This comprises a plate K extending transversely across the air chamber in contact with the shelf K^1, which extends rearward from the beam G^{14}. The plate K has at its rear end a shoe member K^2 which bears against the depending flanges E^2 of the bars E^1 to form sealing contact therewith.

RECENT PATENTS FOR POWER PLANT APPARATUS

Pat. No.	Inventor	Title and Company Assignee
2,275,500	F. S. Broadhurst	Priming system for centrifugal pumps to De Laval Steam Turbine Co. Also 2,275,501 and 2,275,502
2,275,492	R. L. Beers	Ash discharge means for stokers to Detroit Stoker Co.
2,275,954	W. R. Gibson	Water treatment plant
2,275,900	S. O. Huntington	Elastic fluid turbine to General Elec. Co.
2,275,833	W. M. Adams	Boiler draft control
2,276,025	G. W. Davey	Water cooled baffle and wall
2,275,150	A. Moorhouse	Variable speed transmission to Morse Chain Co.
2,275,394	R. M. Hardgrove	Pulv. fuel burning apparatus to Babcock & Wilcox Co.
2,275,395	E. G. Bailey	Fuel burner to Babcock & Wilcox Co.
2,275,981	J. D. Morgan, et al	Analysis of gases to Cities Service Oil Co.
2,272,226	A. M. Rossman	Steam engine
2,272,469	W. H. Lannert	Centrifugal pump to Chicago Pump Co.
2,271,639	R. M. Hardgrove	Fluid heat exchange apparatus to Babcock & Wilcox Co.
2,271,643	D. S. Jacobus	Fluid heat exchange apparatus to Babcock & Wilcox Co.
2,271,880	W. R. Wood	Steam generator to Combustion Eng. Co.
2,275,830	D. F. Warner	Elastic fluid turbine to General Elec. Co.
2,275,243	A. G. Bade	Variable speed transmission to Falk Corp.
2,276,291	G. D. Ebbets	Vapor generator to Babcock & Wilcox Co.
2,276,326	M. Martensson	Fluid heat exchange apparatus to Babcock & Wilcox Co.
2,276,563	S. S. Cook et al	Elastic fluid turbine to Parsons Marine Steam Turbine Co.
2,276,960	D. P. Graham	Burner to Peabody Eng. Corp.
2,276,961	D. P. Graham	Burner to Peabody Eng. Corp.
2,277,004	P. S. Russel	Shifting means, variable speed drive to Reeves Pulley Co.
2,279,618	J. L. Chedister et al	Water tube boiler

Questions And Answers

Question No. 174

The Best Way to Lay Up Boilers

EACH year we lay up our four Heine water tube boilers for 8 mo. When the boilers are not being used the boiler room is very damp. There seems to be considerable difference of opinion as to whether the dampers should be left open or closed during the period when the boilers are not being used. What is considered the best practice in this regard? How about the manhole covers also? J. R.

Question No. 175

Ed's Engine Works Down But Not Up

CAN YOU tell me what is wrong with this card taken from a 15 by 20 in. vertical Fitchburg engine running at 135 r.p.m.? The valves are of the double ported expansion piston type, two of them in the head end and two in the crank end. The engine is running fine in spite of the appearance of the card. E. S. P.

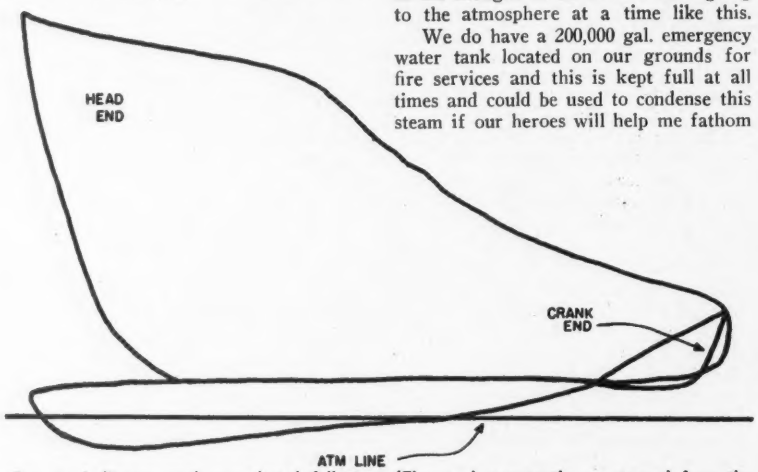


Fig. 1. Indicator card reproduced full size. (The card apparently was traced from the original and shifted about 1/16 in. in the process for the head and crank ends do not line up) data: steam pressure, 95 lb.; scale of spring, 40 lb. per in.; back pressure 7 lb.

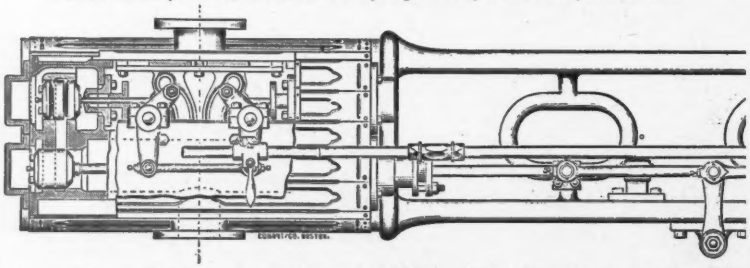


Fig. 2. Cam wrist plate valve motion and double ported piston valves as used on the Fitchburg horizontal engine. The construction on vertical engines is similar, but an adequate detailed illustration is not available. Both engines use double eccentrics

Question No. 176

Gage Calibration

RECENTLY we had an ammonia gage rebuilt and calibrated. If we do not use it for some time, say 6 mo., will the calibration be affected? If it is affected so it is no longer accurate how much will it be off and will it read high or low? J. K. R.

Question No. 177

He Hates to Waste Steam

WE HAVE a 1500 cu. ft. pressure tank that must be charged with steam to 100 lb. per sq. in. and exhausted every half hour. As my plant is located inland and far from any river, a condenser seems out of the question. Still, I weep at the thought of all these B.t.u.'s going to the atmosphere at a time like this.

We do have a 200,000 gal. emergency water tank located on our grounds for fire services and this is kept full at all times and could be used to condense this steam if our heroes will help me fathom out some economical means of utilizing only this 200,000 gal., with a small percentage of make-up.

In other words, the proposition must, above all things, be economically sound. Make-up water rates are $0.65 per 1000 cu. ft. and coal at $6.25 per t. (14,300 B.t.u. per lb.) and 80 per cent boiler efficiency. The 200,000 gal. tank is three-fourths submerged in the ground with no insulation and for 7 mo. each year, the ambient temperature averages 30 deg. F. W. L.

Question No. 178

If the Brine Pump Stops—

TO SETTLE an argument, can some brother engineer explain what will happen and why if: an ice machine is in operation and the brine pump stops and is not started again? J. K.

Question No. 179

Steam Valves for Ammonia?

WE NEED some ammonia pipe and fittings but do not like to buy new ones at this time when they may be needed for some more vital purpose. We do, however, have some small high pressure (extra heavy) steam pipe and fittings on hand. Can these be used for ammonia? If not, why? J. K. R.

Question No. 180

A Problem of Sewage Disposal

Q. AT PRESENT I am faced with a problem of sewage disposal on which I would like for you to send me any available information that you have on hand. Some 700 students are served at one of our Junior Colleges by septic tanks in which the run off is taken care of by laterals spreading out from the tanks. Unfortunately the water level is exceedingly high and the seepage returns upward instead of outward and down.

The City Sewage Disposal Plant is 26 blocks from the school. A double acting pump of sufficient size and a line to this plant will cost in the neighborhood of $20,000, and we do not have nearly this amount of money to spend.

Would you kindly send me what information you have on chemical treatment and disposal plants to take care of the above number of students. R. A. M.

Filter Beds Might Work

A. THIS QUESTION does not show how many septic tanks are used by the institution, nor the design and size of these tanks, nor their location in relation to each other, nor the elevation of inlet and outlet of each tank, nor the relative elevation of the surrounding ground areas; nor anything concerning the volume and periodic intensities of sewage flow. It is therefore impossible to give a definite engineering solution to the problem.

Chemical treatment of the sewage would seem to be too expensive a solu-

tion, and it would not relieve the seepage difficulties. Depending on the available gravity head for the septic tank effluent, it might be possible to construct an acre of sand filter bed above the existing ground to receive the effluent.

Instead of hazarding suggestions which might not be applicable in this case, the writer prefers to refer R. A. M. to the best available book on the subject of sewage disposal. This is the 892-p. Disposal of Sewage, Volume III of American Sewerage Practice, by Metcalf and Eddy. It can be obtained from McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York City; at its published price of $7.00. This volume is considered a good investment for those who have sewage disposal problems to solve. Specifically R. A. M. is referred to Chapter XXXI, "Treatment and disposal of residential and institutional sewage" on pages 782 to 808; and to the chapter describing intermittent sand filters on pages 437 to 455.

Use of sand filters would depend on the cost and availability of sand and on the possibility of discharging the effluent from the septic tanks to a sand filter bed from 3 to 4 ft. in depth; and as to cost on the possibility of utilizing the present tile laterals as an underdrainage system for the sand filter bed.

For best results, the sand bed should be dosed intermittently, thus requiring the construction of at least two beds. Possibly the existing loam or earth could be stripped and used as embankment around the proposed sand filter bed. A pump may be needed to lift the tank effluent to the sand filter beds.

Barrington, Ill. JOHN H. D. BLANKE

Perhaps the Ground Water Level Can Be Lowered

IT IS impossible to give a definite answer to this problem without a study of local conditions. However, we would suggest considering a system of drainage in the septic tank disposal field to lower the ground water to such an extent that the septic tank will function continuously.

This drainage system might consist of open ditches or tile underdrains. If no natural outlet is available for this drainage system, it might be necessary to install pumps and it is likely that a pumping plant for this purpose would cost considerably less than the $20,000 necessary to connect the school's sewerage system with the city sewerage system.

Washington, D. C. T. A. H. MILLER

Question No. 181

Why Boiler Tubes Bow—Up and Down

ON a cross-drum type boiler, the bottom row of tubes bowed upward to such an extent as to loosen the tubes in the headers. Can you tell me what causes the tubes to bow upward in this way? I understand that sometimes they tend to bow downward, but am not sure that this ever happened in my type of boiler, and in the same location where mine bow upward. E. L. E.

UPWARD bowing of the bottom row of tubes in a cross drum type boiler is caused by a deposit of foreign material such as scale or even a very fine film of oil inside the tubes. If such deposit is of sufficient magnitude, or if the heat input is sufficiently high, the tube will bulge in the typical manner.

If, however, such deposit is of relatively small magnitude or if the heat input is moderate, it is possible to heat the bottom portion of the tube several hundred degrees hotter than the top, with the result that the tube will not bulge but will bow.

The reason for its bowing upward is that when the bottom is heated several hundred degrees hotter than the top, the bottom portion of the tube upsets itself in compression, while the top elongates in tension; the overall result being that when the boiler is shut down or the tube temperatures equalize, the bottom portion of the tube will be shorter than the top, and the only way these two conditions can be satisfied is for the tube to arch.

There have been many cases of this upward tube bowing and in some of these cases it has been extremely difficult to persuade the owner of the boiler of its true cause. Many boiler operators understand tube blistering, but they have not had experience with this overheating below the temperature necessary for blistering or bagging.

In the case of low water in the same type boiler, the top tubes will ordinarily bow downward because the overheating occurs on the top of the tube instead of on the bottom.

Question No. 182

Water Measurement

Q. WE HAVE been told that water can be metered by measuring the distance that the jet shoots out from an open ended pipe. How can this be calculated and where are the measurements taken? E. P.

A. Under favorable conditions of steady flow with horizontal pipes, approximations can be made by means of the formula

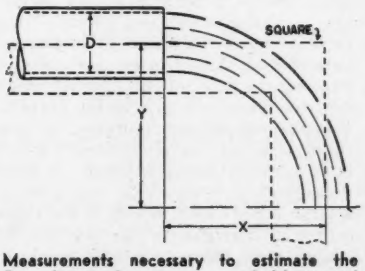
$$G = 2.84\, D^2\, X \div \sqrt{Y}$$

Where

G = the flow in g.p.m.

D = the inside pipe diameter in inches

X and Y = the co-ordinates as shown by the sketch, measured in inches



Measurements necessary to estimate the flow of water from an open ended horizontal pipe

The measurements from small pipes can easily be made by means of a carpenter's square, holding the long arm parallel with centerline of the pipe and the short arm vertically downward.

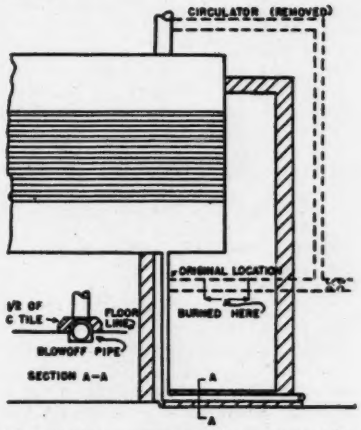
Answer No. 125

Well, Blow Me Down! What a Hookup

ON WHAT seemed to be good advice C. W. Z. installed a circulating blowoff system on a new 285 hp. h.r.t. boiler and immediately got into trouble. On p. 92 of the August, 1941 issue he wanted to know why the system did not work and asked five questions dealing with blowoff pipe protection, scale and feedwater treatment Answers and discussions were published on pp. 98 and 99 in December; p. 100 in January; p. 98 in February; and pp. 94 and 95 in March. The article, A Circulating Blowoff System That Works, by R. A. Barnhart, Chief Engineer of the Livermore Sanitarium, Livermore, Cal., on p. 76 of this issue, is a continuation of this discussion and has a direct bearing on the subject.

Says feed through the blowoff OK—Inspectors say no!

SOMETIME ago I had an experience similar to the one discussed under Question No. 125. In the original layout (shown dotted) there was continual trouble with the filling up of the blowoff pipe. This was on a boiler with 125 lb. pressure running 24 hr. a day, used for heating and driving a 100-kw. generator.



The original arrangement shown dotted did not work well and the blowoff pipe was changed as shown by solid lines

First the circulating line was taken out as being of no use. Then twice in 2 wk. the extra heavy pipe used for blowoff pipe burst at the point indicated. The blowdown protection wall was increased in size but that did not help. Finally the blowdown pipe was run to the floor of the boiler and from there to the outside in a small trench with the blowoff pipe covered with one half of a C tile. The boiler has been running several years without any further trouble.

I was glad to see some remarks on this question suggesting that if the feedwater was fed through the blowoff this

trouble would not occur. In this case the chief engineer wanted to do just that thing, but insurance and city inspectors would not O. K. it.

This same organization has 6 boilers in other plants that were used first for high pressure and are now on low pressure, and have been operating for 17 yr. During all this time there has never been a blowoff failure or line ordered replaced by city or insurance inspectors and all these boilers have the feed coming in through the blowoffs.

Outside of a slight accumulation of scale at that point, which is never sufficient to even get suggestions from inspectors, I see no harm to the boiler.

Maywood, Ill. GEORGE W. REDMAN

Says Blowoff Cocks and Bustles Are Passé

IN THE December issue, p. 99, G. C. Hallquist states "The best blowoff cocks are the asbestos packed, iron-body plug cocks which are durable and safe."

With all due respect to Mr. Hallquist's opinion, the use of a plug cock in boiler blowoff service is as much out-of-date as women's bustles or Model T Fords. Few engineers would consider, in these modern times, using plug cocks when plunger or piston seatless blowoff valves are available.

These valves have many advantages over plug cocks, as they do not have any seating surfaces to cut and leak nor are they hard to operate. They are easily packed when necessary, which is not often, if properly handled and serviced.

In the plant where I am chief engineer, we have used plunger seatless type valves for nearly 14 yr. on 425 lb. pressure boilers, with very good operating results. This experience is shared, I understand, by a number of plants using blowoff valves of the same type.

JOHN KILPATRICK

Plymouth Meeting, Pa.

Answer to Question 134

How Can He Regulate His Blowback?

ON PAGE 94 of the October, 1941 issue, John Fremer asked how he could regulate blowback on a safety valve. This varies from 9 to 18 lb. in spite of the fact that the adjusting ring is screwed down to the limit. Other answers were printed on p. 101 of the January issue. The following letter does not answer the question, but it does bring out some important points.

Pass the Buck to the Boiler Inspector

MINIMUM BLOWBACK of a safety valve should be not less than 2 per cent for valves set for 100-300 lb. or, for lower pressures, not less than 2 lb. Always notify the boiler inspector of safety valve changes, for in many states this is a law.

Blowback is always set and sealed by the manufacturer of safety valves. The best bet is to let the valves alone and have one of the manufacturers' representatives call and adjust the valves or in emergency cases have a man who is competent adjust the valves.

Safety valve chattering is caused by too much friction and pressure drop located in connecting nipple or it may be in the escape pipe. Insufficient blowback will also cause a safety valve to chatter. You can remedy this condition if you increase blowback.

Fairview, N. J. MARTIN N. GOZDENOVICH

Answer No. 141

His Watch Gets Magnetized

LOUIS SCHAEFFER has been having trouble with his watch because he works around d.c. machinery. On p. 96 of the December 1941 issue he asked for details of a method to demagnetize the watch—something that would be cheaper than going to a watchmaker each time, yet more practical than leaving the watch at home. Other answers were printed on p. 100 of the April issue.

A Slow Retreat Works Well

PERHAPS a very simple remedy for magnetized watches I used to use with good results some 30 yr. ago, when in charge of d.c. generators, would be of use to Mr. Schaeffer. Suspend the watch securely on a piece of string, about a foot long. Twist the string up tight so that when released the watch will spin freely. Take the watch close up to field coil, or wherever it gets magnetized, start it spinning briskly, and walk away to well beyond the magnetic influence, keeping the watch spinning all the way.

Some watches have loose crystals, liable to come loose, and I found it an advantage to put the watch in a small cotton sack, which can be tied on to the end of the string. I now find it is much less trouble to leave my watch at home, have a good clock in the powerhouse, and another in my car.

Newton, Pa. O. H. WARNE

If the Wife Doesn't Object—

IT WOULD be much cheaper for Mr. Schaeffer to buy a dollar watch to use during working hours. They will not become magnetized when working around electrical equipment, they keep fairly good time and will stand more knocking around than an expensive watch. Or, if he prefers his present watch, why not have a non-magnetic balance wheel put into it, or even a soft iron case?

Or he should be able to find a growler used for checking armatures somewhere around, perhaps in the neighborhood garage as a last resort. With one of these it is a very simple job to demagnetize any object. Just tie a string on the object to be demagnetized and slowly lower and raise it between the jaws of the growler when it is energized with alternating current. For that matter, you can use any coil through which an alternating current is flowing for demagnetizing. I have demagnetized a watch by laying it on a large metal object which is not magnetized over night, as the top of the kitchen stove when there is no fire in it.

DONALD OSTERHOUDT

Poughkeepsie, N. Y.

The Only Thing Passed Up Is a Sundial

THIS QUESTION of demagnetizing a watch reminds me of an experience I went through during my college days. As it was necessary to work around direct current machinery quite a bit in laboratories and we all had watch trouble consistently. In order to eliminate the expense of going to a jeweler every time we used an air core inductance which was part of the laboratory equipment. As well as I can remember it consisted of several hundred turns of about No. 20 insulated wire wound on a wooden core. When connected to a 110 v. source a current of about 2 amp. was indicated. Our watches were then lowered several times into the center of the coil and then slowly withdrawn from the magnetic field. Since magnetizing a watch does it no very great good; however, I would suggest getting an electric clock for the machinery room and leaving the watch at home or in a locker.

W. C. MORRIS, JR.

George Even Has the Speed Worked Out

USE A PIECE of twisted twine on the watch chain, then place the watch on side of the generator between any two coils and let it revolve in either direction. When about to stop revolving, pull it from between the coils slowly. Do this 2 or 3 times, turning the watch in the same direction each time. It makes no difference whether the generator is running or standing still. Another method is to pull the magnet slowly between the poles of a magnet as shown by Fig. 1 about 1 ft. in 5 sec.

For testing the efficacy of the treatment, set a compass on top of the watch on a clear desk or bench or where the compass will not be attracted by nearby iron. If the compass stands still then the magnetism is out of the watch. If not, repeat the demagnetizing process. If it is worse, then do the same thing over but turn the watch face down when pulling it through the magnet.

Demagnetizing a watch by means of a horseshoe magnet

If a horseshoe magnet is not available, the same result can be obtained by pulling the watch between the generator field coils on a flat board. Use thin strips on the sides so the watch does not fall off. This too can be done either while the generator is running or stopped but not at the same time in both cases. Pull the watch about 2 ft. in 5 sec. when the generator is stopped and about 3 ft. in 5 sec. when the generator is running.

New Orleans, La. GEORGE DEICHMANN

GIVING BOILER SCALE THE *third degree*

NALCO technicians are relentless when it comes to prying the truth out of a scale formation. They don't leave anything undone until they have all the answers and when the investigation is complete they know how to do away with the malefactor.

You profit by their methods because all work is done *in the Nalco Laboratories* if necessary with samples of your own feedwater so that proper treatment to best meet your particular requirements can be evolved.

It will pay you well to investigate the facilities and methods behind the Nalco System. Write today to arrange for a Nalco Survey of your plant — you'll be glad you did.

Large illustration—Making a photomicrograph of scale formation produced in a Nalco experimental boiler.

•

Inset — Typical scale formations produced on steel tubes in Nalco Laboratory experimental boilers.

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Answer No. 148

How Can He Prevent Carryover?

WHEN the safety valve on a 100-hp. H.r.t. boiler pops, the boiler primes badly. On p. 96 of the December, 1941 issue, Clyde Wittenmeyer asked what might cause this and how it could be corrected.

Suggest the Piping is at Fault

REFERENCE to carryover in this question makes it sound very much like a situation I once had.

Mr. Wittemeyer refers to carryover when safety valve lifts and from this I judge he was not troubled at other times.

Without information as to the hook up of the steam line and safety valve outlet, I hazard a guess that the safety valve and the steam line may be taken from the same outlet. If so, they should be separated if possible.

It is also possible concentration of boiler water may be too high and the opening of the safety valve is all that is needed to lift the water. I used to have this same trouble until the safety valve and steam line were separated.

Mechanicville, N. Y. R. F. LEACH

Says the Valve is Too Large—Try a Siamese Connection

SINCE the engine primes only when the safety valve lifts, it is quite evident that the steam relieving capacity of the valve is too great for the size of the boiler. This assumes correct adjustment of blowdown of the valve and that the water level in the boiler is no higher than the second cock. I suggest that a relief valve of much smaller capacity be installed and set to blow at a pressure of 1 to 2 lb. less than the one now in service. No new boiler connection is needed for this, as both valves may be set in parallel on a yoke connected to the flange used for the single valve.

Menard, Ill. GEORGE HOLMAN

Answer No. 152

How to Cut Pump Packing

WHAT rule or formula do other readers use for cutting piston packing for a boiler feed pump? This question was asked by A. F. C. on p. 99 of the January issue in particular reference to a pump that runs hot. Refer also to the answer to Question 159—What Valves and Packing Should Be Used—on p. 93 of the March issue.

Cut Rings With Sufficient Clearance

ONE MUST assume that the packing in this question is used on the water and and I suspect strongly the rings have been forced home in a dry condition without considering that the packing would expand.

When the rings have been cut to working size, the joints, which must be lapping, should be cut $\frac{3}{16}$ in. short of meeting. Getting the proper thickness is easy because all the hydraulic packings are made up of layers.

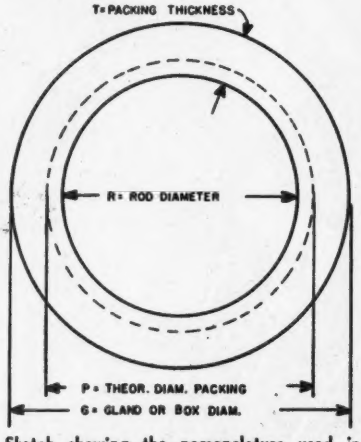
Before fitting the rings (after cutting) they should be coated with a mixture of cylinder oil and graphite to minimize any friction. The insertion of the packing into the piston recesses should be accomplished by finger pressure. A partial expansion to working size (referring to the piston packing) should be accomplished by immersing them in hot water for several hours.

Glendale (L. I.), N. Y. CARL EGERTER

Here is a Formula That Has Been Tested

THIS QUESTION may perhaps be answered by an empirical formula from my own experience. In the pipeline station where I once initiated the run tickets there was frequent need for packing on the plunger pumps, both in the station and for the field pump units. All of these were either plunger, or, outside packed types, handling a rather gritty crude oil so consequently the repacking jobs were frequent.

As a short-cut, a series of wooden cylinders, a foot in length, were turned up to the diameters of the various rods and plungers to be packed. These cylinders were used as forms around which the packing would be wrapped and cut to the proper length. This was done by sawing off, with a hacksaw blade from which the rake had been ground, the packing at the point where the turn lapped the end of the packing.



Sketch showing the nomenclature used in the formula for cutting packing

I thought the method was fool-proof until one day a pick-up mechanic and helper were put to work driving in a set of glands on a new pump casting. Before he was caught at it, he had used every single one of the cylinders as driving blocks, and they were splintered beyond use for anything but kindling!

With the sizing cylinders gone, a formula was worked out which enabled the packing to be cut to the proper length when laid straight and flat. If the rod diameter be represented by R, the gland diameter by G, and the thickness of the packing by T, the formula becomes

$$P = \pi(R + 2T/3)$$

where R is less than 4 in. and

$$P = \pi(R + 4T/5)$$

where R is over 4 in.

P, in both cases, is the length of packing with square cut ends for the required rod diameter.

As example, if the formula be applied to a 2-in. rod, on which $\frac{3}{8}$-in. packing is to be used, the equation becomes

$$P = 3.14\ (2 + \tfrac{1}{4}) = 7.06 \text{ in.}$$

This may be cut as 7 in. and be plenty close for a good pack-off against both rod and gland. This compares with 6.28 in. for rod circumference and 8.63 in. for the circumference of a packing ring around the outside. Thus, if cut to the rod measurement, the packing would be $\frac{1}{4}$ in. short, and if to the gland dimension, 1.57 in. too long.

By measuring along either edge, or at any distance in from the edge if parallel thereto, packing may be cut on the bevel as well as square ended by this same formula. I have never seen any formula in print, but have used the one cited for most of the commoner types of braided packing with good results.

On the smaller sizes, experience showed that packing if cut to a circle one third the depth of the packing circle from the inside as shown dotted in the sketch, forms a satisfactory seal along the rod. Also that the slight vee above the theoretical length is filled by expansion of the packing under service, but without buckling.

Houston, Tex. CHARLES C. LYNDE

Blackout Questions

AS A SUGGESTION of what not to ask your utility company we list a few of the less important questions asked the P. G. & E. Company following the recent blackout experiences in San Francisco.

This company received at least a thousand telephone calls during the first blackout and more than twice as many during the second. The day following each blackout about 750 men and women visited the company's office to ask an average of a half a dozen queries apiece.

Many who telephoned or came in were apartment house owners, managers and janitors seeking information on how to turn off lights that normally are controlled by automatic clock switches. In 10 da. the company's service men in San Francisco visited 75 apartment houses to solve this problem and as many more cases were handled by explanations given by phone.

Thousands of other questions covered almost every conceivable subject. Here are a few:

"Is this really an air raid alarm or just practice?"

"How long will the blackout last?"

"If I give you the address of my store, would you send a man to break in the door and turn off the light over the safe?"

"When I had to put my lights out I had a cake all ready to put in the oven. Now what?"

"Will they repeat 'The Lone Ranger' when the blackout is over?"

"Would I be allowed to go out and sit in Twin Peaks Tunnel?"

"Will it be all right if I open the door just a little to let my husband in when he comes home from lodge?"

IT'S EASY TO REGRIND THESE LUNKENHEIMER VALVES

with a few minutes effort they can be made as good as new

Valve regrinding is really a simple operation—it can be done so easily and quickly without taking the valve from the line.

And in this critical period when savings in maintenance time mean so much toward total production—even the time saved in the regrinding operation over replacement is of vital importance.

All parts of Lunkenheimer Regrinding Valves are renewable. Having a few parts available in stock for an emergency can also save much valuable time.

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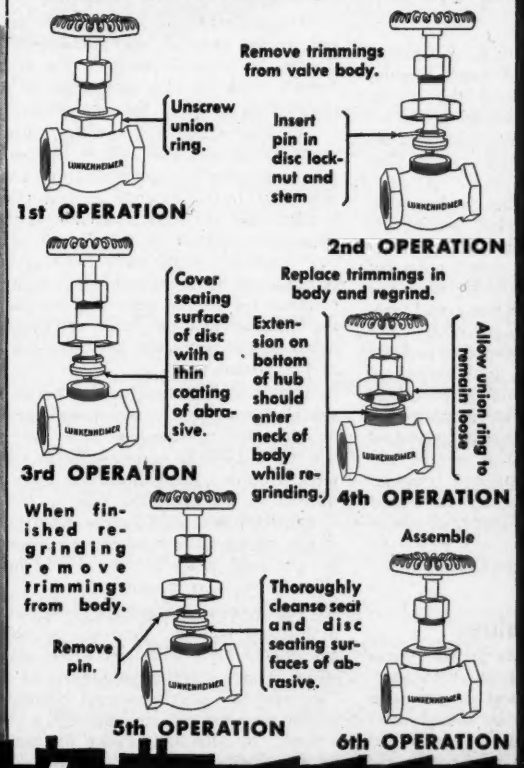
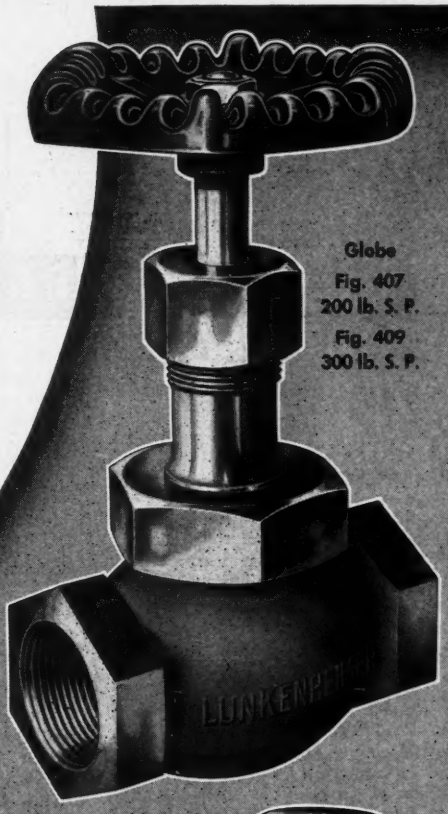
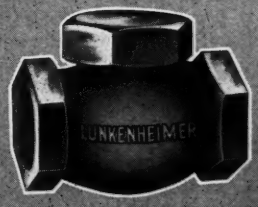
INSTRUCTIONS FOR REGRINDING

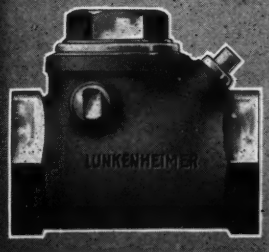

Unscrew union ring.
1st OPERATION
Remove trimmings from valve body.
Insert pin in disc lock-nut and stem
2nd OPERATION
Cover seating surface of disc with a thin coating of abrasive.
3rd OPERATION
Replace trimmings in body and regrind.
Extension on bottom of hub should enter neck of body while regrinding.
Allow union ring to remain loose
4th OPERATION
When finished regrinding remove trimmings from body.
Remove pin.
Thoroughly cleanse seat and disc seating surfaces of abrasive.
5th OPERATION
Assemble
6th OPERATION



Globe
Fig. 407
200 lb. S. P.
Fig. 409
300 lb. S. P.



Lift Check
Fig. 414—200 lb. S. P.
Fig. 413—300 lb. S. P.

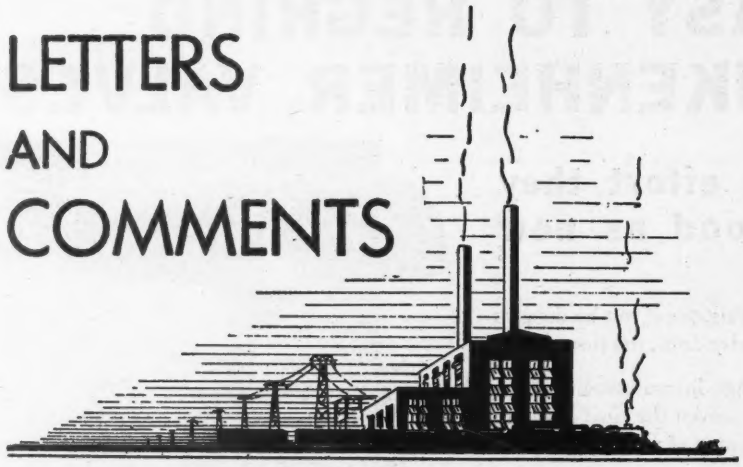


Swing Check
Fig. 554—200 lb. S. P.
Fig. 624—300 lb. S. P.

Since virtually all materials used in the manufacture of valves are on the list of critical materials, valve users are urged to furnish the highest possible preference ratings on their orders. This will be of mutual helpfulness.

LUNKENHEIMER VALVES

LETTERS AND COMMENTS



How Large a F. D. Fan?

IN YOUR FEBRUARY, 1942 issue p. 94, an article by E. M. Sims deals with forced draft air requirements. This appears to be correct as far as it goes, but to the uninitiated it might appear from the chart on p. 108 that the reading taken from this chart could be used directly for specifying forced draft fan capacity.

There are many other factors which must be considered in addition to those enumerated by the author. For example, all the air for combustion does not enter the furnace under control. There is always a certain amount of furnace infiltration depending, of course, on the furnace size, construction, furnace draft, type of stoker, etc.

Also there is a certain amount of outward leakage from the ducts and stoker windbox which does not enter the furnace. These two factors must be evaluated and consideration must also be given as to whether it will be possible to operate under any and all conditions with the excess air assumed in using the chart or the formulae.

It is customary to add a liberal tolerance to the calculated volume in selecting a fan so that much higher than normal excess air can be carried without cutting capacity on the unit. It is thought that readers should have been advised of these other important factors and given some idea of their magnitude.

Chappaqua, N. Y. W. S. PATTERSON

Asbestos Is No Joke

AN ARTICLE on p. 93 of the February issue entitled Improving a Balky Ash Hoist Motor speaks rather disparagingly of asbestos as an insulation, in the last two sentences of the second paragraph where it said, "Someone jokingly suggested the motor be wound with asbestos insulation. We had not heard of just that, but we investigated the possibilities of the new fibre glass insulation especially made for motor winding and field work."

Evidently, the writer, P. C. Ziemke, wasn't aware of the fact that asbestos insulated magnet wire has been used for Class B windings long enough and successfully enough, and still is not withstanding the use of glass insulated magnet wire, to have passed out of the amusement class.

The motor operating under the conditions described in the article, would be ready to do all that was required of it at all times if the coils were wound with our asbestos insulated magnet wire and the leads and coil connections were of Rockbestos A.V.C. Motor Lead Cable which is insulated with asbestos and varnished cambric . . . and that's no JOKE!

E. M. HEERY

Rockbestos Products Corp.

Production Testing of Aircraft Engines

THE excellent article of C. A. Chayne, Production Testing of Aircraft Engines in your May, 1942 issue on the subject of testing aircraft engines by means of driving electric generators which will deliver energy to the supply system, has been read with interest.

I fully agree with the conclusion as to the desirability of thus making an economic use of the gasoline which in any case must be used, but, would point out that the figures given as saving in energy charge are higher than the actual economic savings which are effected.

Actual economic savings in such an operation consist of the total fuel saved in the reduced production of purchased energy by the seller of same, rather than in the reduction of charges for purchased energy, since the operation of the test sets is of a too uncertain and irregular nature to enable the factory to depend upon them as a reliable supply of power at all times. S. FERGUSON

The Hartford Elec. Light Co.
Hartford, Conn.

More on pH Values

ACIDITY and Alkalinity Measurements in the March issue p. 64 was both interesting and informative and of course is much appreciated. By no means do I intend to be critical when I suggest that the phenomena of pH, or the potential of hydrogen, would be better illustrated if the Table I presented with the article were in slightly different form.

If we assume that: the acidity of the water is due to positively charged hydrogen ions; the alkalinity to negatively charged hydroxyl ions; and at a pH of 0.0 acidity is at the maximum value; then there is 1 gr. of hydrogen ions (H^+) per liter, and 0.000,000,000,000,01 gr. of hydroxyl ions (OH^-) per liter. As the solution becomes progressively less acid these values exchange places in the acid and basic scale, until we have a solution of maximum alkalinity, or 0.000,000,000,000,01 gr. hydrogen ions (H^+) per liter and 1 gr. hydroxyl ions (OH^-) per liter. A table illustrates the phenomena more clearly than words.

pH	Grams H per liter	Grams OH per liter
0.0	1.0	.000,000,000,000,01
1.0	.10	.000,000,000,000,1
2.0	.01	.000,000,000,001
3.0	.001	.000,000,000,01
4.0	.000,1	.000,000,000,1
5.0	.000,01	.000,000,001
6.0	.000,001	.000,000,01
7.0	.000,000,1 Neutral	.000,000.1 Point
8.0	.000,000,01	.000,001
9.0	.000,000,001	.000,01
10.0	.000,000,000,1	.000.1
11.0	.000,000,000,01	.001
12.0	.000,000,000,001	.01
13.0	.000,000,000,000,1	.1
14.0	.000,000,000,000,01	1.0

Wingdale, N. Y. SAM WILLIAMS

Further Comment on Problem 16

THERE is no theoretical reason why the system (Problem 16, p. 94, 1941) cannot be operated as described since both neutral systems are using a common connection which is one very often found in daily application.

A comparable condition is that existing in the case of a 3-phase rectifier where the neutral point of the transformer bank is also connected to the negative (–) side of the d.c. circuit.

An application of a similar nature is made up where a low voltage 3-phase, 4-wire generator is controlled from a distant point. In this case the generator field is controlled through a variable resistor (rheostat) located at the distant point, one conductor being used for one field terminal while the other field terminal is connected to the generator neutral at the machine and the other resistor terminal to the generator (system) neutral at the distant point.

It was stated that the a.c. system is well balanced, but in any event there is no objection to carrying both a.c. and d.c. current in the same conductor. The effect of this combination is roughly indicated in the appended diagram. The d.c. current has been shown positive; if it was negative the resultant curve would be displaced below the zero line rather than above it as shown.

The operation of such a system from a practical point of view has an objectionable feature which is often raised. This applies to the possibility of the "burning off" of the neutral connection of the transformer bank through a short circuit. In such an instance the neutral of the system might have its voltage to ground raised to full voltage between lines. While this condition may not often occur, its possibility should be pointed out.

Brooklyn, N. Y. C. O. VON DANNENBERG

FOR TOUGH BLOWDOWN JOBS!

Long Service with EDWARD Plus Value Blow-off Valves

PROMPT DELIVERIES!

FOR exacting power plant, marine, oil field boiler or process piping blowdown service, you can't beat Edward steel blow-off valves. Simple functional design eliminates all frills and unnecessary parts that may cause clogging, and which are subject to erosion, frequent adjustment or replacement. The globe type seating design means tighter closure and less leakage. Slow opening type avoids damaging shock to piping. Seats and disks are wear-resistant EValloy stainless steel, or hard surfaced. Straightway and angle designs make possible a wide variety of installation combinations to meet space limitations. For 150 to 1500 lb sp service.

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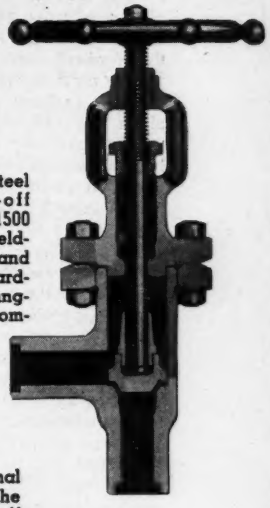
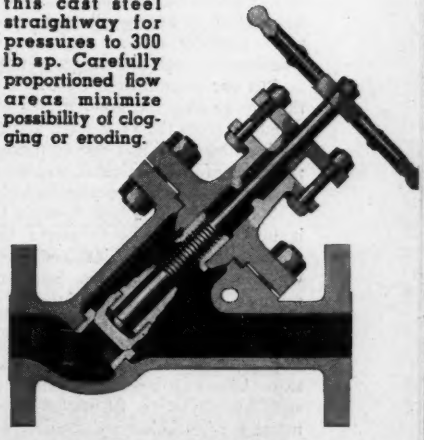


Edward forged steel angle blow-off valve for 900-1500 lb sp, socket welding ends. Disk and integral seat hard-surfaced with tungsten-cobalt-chromium alloy.



Typical functional simplicity of the Edward blow-off design is shown in this cast steel straightway for pressures to 300 lb sp. Carefully proportioned flow areas minimize possibility of clogging or eroding.

EDWARD *Steel* VALVES
CAST AND FORGED

Why Do They Quit?

"We can't seem to keep these fellows on the job!" was the way one of the top management burst in on the chief engineer, by way of greeting and announcement that the plant oiler, who only a week before had been hired, had already quit. "We're advertising for men, right along, and I wonder what some of the other plant executives think!" the discomfited superior moaned querulously. "They must think we're just a no-good place to work for! Something's got to be done about this, for it's disrupting the entire plant, this constant hiring and breaking in, all to no good purpose."

The chief engineer just listened, respectfully, non-committally. He had become calloused to such outbursts and had long since learned it was best to just let them peter out. But he was perplexed and at a complete loss, like many another engineering head who finds the staff members, year-round, consistently gravitating away from the plant, with the attendant disconcerting necessity for finding out and developing replacements.

Naturally there is a tremendous and exhausting waste entailed with such staff disintegrations, the impeded and lost plant production and additional labor required searching for desirable individuals, then properly coaching them, mounting to just so much waste.

The problem oftentimes revolves about the fact that the younger staff members are not properly encouraged and inspired with the full importance of their particular positions, however minor these be. A veteran engineer informed the writer: "We approach this problem differently. I have always contended that every staff position is vital to the proper operation of the power plant, and I make haste to impress new men of this fact. Too frequently newcomers become disheartened and disgusted because they feel that their jobs are of no particular significance, and right there is where the trouble starts!

"If no proper interest is exhibited in these men, and no effort made to disassociate them from their false notions, the result is they too often quit, without giving any reasons, and when there really is no substantial reason for their quitting. And in nearly all such cases the chief engineer is none the wiser. The troublesome problem continues unabated.

"In our organization we overcome all this by gaining the good graces of new members from the very start, and this by making the individual realize the full importance of his particular position, however minor. Let me particularize!

"If we engage a new fireman I make it my own business to stress the importance of this man's job, and how much we are depending upon him and his services for uninterrupted operation of the plant. I will already have a fair knowledge of this man's background, but I will probe further, and take pains to show how he himself can advance himself through study of the proper engineering text-books and other pertinent educative means, and how, by working for and with us, he can promote himself to higher positions. The result is he is encouraged, instead of easily becoming discouraged. He knows he can improve his interests right where he is; therefore he wants to stay with us."

Brooklyn, N. Y. Frank V. Faulhaber

He Thinks Our Units Are Nuts

Bill Maddock said something in his preachment on page 93 of the September issue for there is no question but that even the United States will some day fall in line and adopt the metric system. The handwriting is on the wall. The transition period from our present standard to metric will no doubt cause much expense and inconvenience, but the sooner we jump in and have it over with the better.

A peculiar thing about the metric system, a thing that most Englishmen and Americans don't know, is that the celebrated James Watt, English engineer and scientist, was the man who originated the decimal system of measurement. Until a short time ago I had always considered it of French or German origin, but that is not so. Nor is it well known that our present English system is of German origin.

As long as it is necessary for us to endure the present system which Bill Maddock deplores, this writer's suggestion is to make the best of it and endeavor to memorize some sort of relationship between the two systems. The simplest way that I know to remember the relationship is the following:

ENGLISH		METRIC
Length	—1 yd. + 10% =	1 meter
Weight	—2 lb. + 10% =	1 kilogram
Volume	—1 qt. + 5% =	1 liter

That isn't difficult to remember. You add 10 per cent in each case excepting "liquid measure" and there you add 5 per cent. Associate liquid with the old pre-prohibition beer at 5 ct. per glass and you'll never forget it.

Newark, N. J. W. F. Schaphorst

A Californian Finds Aladdin's Lamp

It was some time before I could bring myself to believe that Chief Engineer and Aladdin's Lamp were not one and the same thing. I used to write it after my name with the feeling that somehow I had been cheated because I was not any smarter than I was before.

Then one day when I was ready to tear my hair because my Ray burner would form large deposits of carbon on the side walls (when knocked off this carbon took some of the wall with it each time, and none of my friends or the burner company had been able to do or suggest anything that helped) there walked into the plant a (so I thought) harebrained, loudmouthed boiler compound salesman.

Eventually he inquired what my trouble was and when I told him, he said, "well take a file, bevel off the edge of that spinning cup to about 45 deg. and your troubles will be over." Filing a 45 deg. angle on an edge about 1/32 in. in thickness was too silly for words. But I couldn't forget it, and after one more carbon knocking I said to myself, "What can I lose, especially if I don't let anyone know about it?"

So one night after everybody had gone home (we shut down every night) I sneaked in the boiler room, swung open the Ray burner, looked all around to be sure no one was watching, started the motor and held the file on the cup.

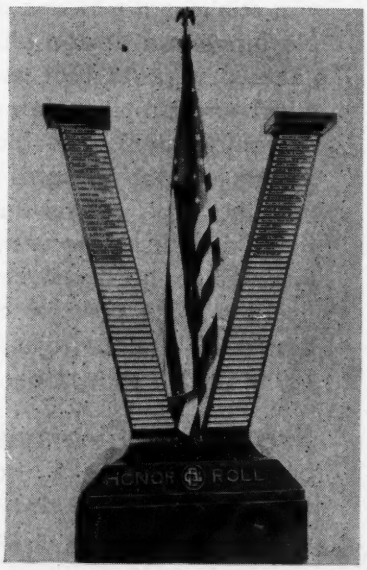
Believe it or not we never knocked another hunk of carbon, the boys all thought that I was pretty smart to fix it after the company had tried four times. Well I had found Aladdin's Lamp, and the limit to its magic was in me and me alone.

I realized then a fellow might be very smart and chief of a large plant, and still never really had experience with my particular problems. In place of taking it for granted that because he was chief, he must be right, I began asking if he had ever done the same things I wanted to know about. It is surprising how much misinformation a fellow can accumulate when he is really in need of the real thing.

Speaking of war, Sunday morning five large planes cruised majestically across our boiler room seemingly just missing the smoke stacks; a few minutes later there were only three, the other two being flaming wrecks on the hill side, only one man escaping out of 15. They were victims of fog.

While they were in no way connected with it I was on duty preparing for an air raid, in which some of this institution was supposed to be bombed and destroyed. Seems sort of ironical that we should lose two big bombers in an imaginary air raid in which they had no part.

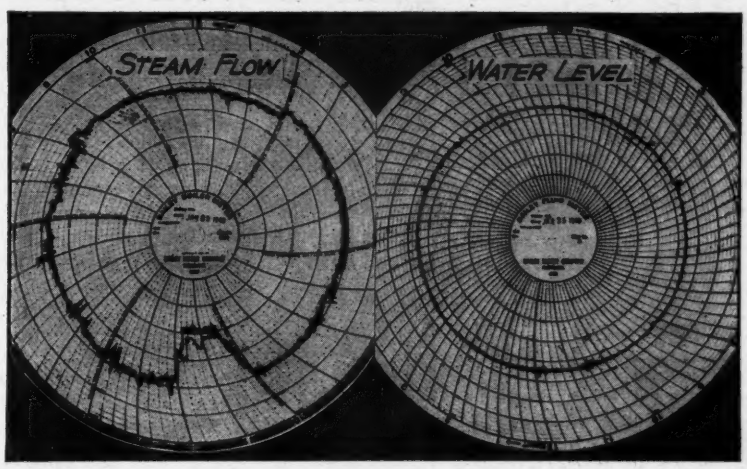
Livermore, Cal. R. O. Barnhart



W. P. Batdorf sent in the above photograph of the Victory "V" set up in the assembly room of the Gardner-Denver rock drill plant in Denver, Colo. Employes who enter the U. S. service have their names inscribed on a card. At night the flag and "V" are floodlighted

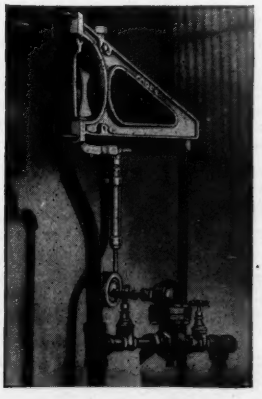
1300 POUNDS W. S. P.

Fired with pulverized coal or oil, this 1300-lb. B. & W. boiler in prominent Eastern utility plant normally evaporates 275,000 lb. per hour with a maximum 300,000 lb. Excess water pressure at pump discharge is 250-300 lb. Boiler water level held within plus or minus one inch of normal by the COPES Flowmatic.



★ *High excess water pressures have little effect on the level control*

FOR SMALL BOILERS



On small boilers at moderate ratings and pressures, the COPES Type OT quickly pays for itself with correct, continuous feed that means more steam per pound of fuel. Makes operation safer by stabilizing water level. Fully-automatic, it saves time for operators. Write for Leaflet P-2A.

YOU need not worry about high excess water pressure if a COPES Flowmatic Regulator controls the boiler feed and water level. These charts show water level varying only plus or minus one inch with an excess pressure of 250 to 300 pounds. In other cases, the Flowmatic has continued to hold the level well within desired close limits with excess rising above 450 pounds. And service is dependable because even the relay-operated Flowmatic, used for high pressures, has as few parts as possible and each part is built to stand up under much more severe conditions than it will meet in operation. Write for Bulletin 429.

NORTHERN EQUIPMENT CO., 622 GROVE DRIVE, ERIE, PA.

Feed Water Regulators, Pump Governors, Differential Valves
Liquid Level Controls, Reducing Valves and Desuperheaters

BRANCH PLANTS IN CANADA, ENGLAND REPRESENTATIVES EVERYWHERE

★ GET CLOSER LEVEL CONTROL WITH THE COPES FLOWMATIC

Why We Don't Print More Cost Articles

HAVE BEEN going over the operation records of the ——— Plant with the idea of writing up a story for you as suggested at the time of your last visit to ———. However, I find so many glaring inaccuracies in the operation details as prepared by the chief engineer that I do not believe you would care to print them and I certainly would not want my name connected with an article of that kind.

War Savings Bonds

TO MEET the desired goal during 1942 of 60,000 planes, 45,000 tanks, 20,000 anti-aircraft guns, 8,000,000 t. of shipping, as well as mobilizing, training and equipping millions of fighting men, it is stated by the Secretary of the Treasury that somewhat over 50 per cent of the nation's productive capacity and a like share of national income must be directed to war effort.

This means 60 billion dollars from July 1, 1942 to June 30, 1943. After Congress has determined what is to be raised by taxation, the Treasury states that probably some 35 billion dollars must be borrowed.

To avoid inflation, from bidding by consumers for the limited supply of consumer goods available, it is desired that War bonds be purchased by individuals from income, and, the Treasury Department has set as a goal, for the 12 mo. period from July 1, the sale of Savings Bonds, of Series E, F and G, to an initial cost of 12 billion dollars, or something over 10 per cent of the estimated national income.

To reach this goal, rate of purchase of War bonds will have to increase to 2½ times that for the period from May, 1941 through March, 1942. Obviously, not all workers can invest 10 per cent of their income, hence those who are able are urged to set aside considerably more than 10 per cent of income for that purpose.

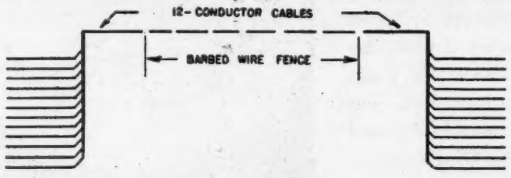
It is intended to set up quotas for states and counties, and systematic savings by payroll deductions is recommended as the most effective plan. At present some 50,000 firms are making this plan available to 20,000,000 employes, but the percentage of employes participating is 45 and the percentage of payroll allotted is 4.8.

The Treasury Department urges that the participation be raised to 90 per cent of employes and 10 per cent of the gross payroll. The Department is offering "case histories" of successful methods for reaching this result to those firms who desire assistance in setting up a savings quota and securing co-operation by joint committees of workers and management.

This Can Be Used On Right Hand Models Too

Charles V. Johnson, late of Watts Bar, Tenn., and now of Cincinnati, O., has a sympathetic nature and cannot resist an appeal for help. This trait sometimes leads to interesting conclusions and his latest adventure and problem is printed below. Mr. Johnson's solution will be printed next month. Note that this is NOT a contest of any kind, but simply a brain teaser to test your ingenuity. The letter and problem follow.

"Returning one day from a hurried trip 57 mi. back into the mountains to install a flashlight bulb for a blind hermit, I was accosted by a tearful farmer whose urgent plea involved me in the problem presented."



THE PROBLEM

A left-hand winter model Superskiliunkdum was to be controlled, interlocked and metered from the farmer's barn by an electronic Whooferdilopipidus located just north of Briar Patch No. 3.

To be brief, my chief problem was the correct identification of the 12 conductor control cable, made extremely complicated in that the 12 wire barbed wire fence serving as a section of the control circuits crossed an impassable canyon, necessitating a 7 mi. drive over unimproved goat trails to reach the other end.

With only a test buzzer and with no help, I was concerned mainly with holding to a minimum the number of trips to that other end preparatory to a correct hook-up. The barbed wire fence, incidentally, was mounted on dry wood posts and no wire was grounded for testing purposes at either end. (Mr. Johnson's solution will be printed next month—save your solution and compare it with his.)

Priorities Bring a Squawk From an Unwelcome One

Editor's Note: Through sources of which we know nothing the versatile A. H. P. forwards a letter addressed to us and headed 212 Brimstone Ave., Hades. In his questionable role of intermediary, A. H. P. has even written the subhead. Because we fall for the flattery of being called gentlemen and the implication that we will some day need wings—we print the letter, but disclaim all responsibility and have affidavits from the Circulation Manager that the author is NOT on our subscription list. If you have any useful suggestions do NOT send them to us—send them in care of Hitler or Hirohito.

Hell about to close its doors—shortage of fuel shocks shivering sinners—temperature in Hell down to 2323 deg. C.—priorities deny Devil coal, sulphur, hot tar, pitch and allows only one pitchfork—end of Devil's tail shorn for Diesel hot bulb—truce between Devil and the Almighty—Devil appeals to outstanding engineering publication for help and advice.

Gentlemen:

It may surprise you to know that your publication is well known and thought of in Hades; heat, and the production thereof being, as you know, my specialty, gives us a common bond of interest.

Frankly, gentlemen, I am in desperate circumstances. I have had to shut down all but my major heating plants—have discontinued my deep fryers entirely, my spits no longer operate and the best I can do for my righteously indignant sinners is to parboil them gently.

In an effort to provide temporary accommodations for my boarders—who are threatening to leave in ever increasing numbers, I have declared a truce with the Almighty, begging Him, in all humility and repentance (oh, yeah) for past insults, to take in the discontented. Really, there's no place for them to go.

But He tells me that, priorities being what they are, He simply can't get any building materials and there are definitely no "New Mansions." I thought I was hard up but listen to this. The Almighty tells me that He has cut down 50 per cent on the flights of the Angels and, moreover, all newly arriving Saints have to do with one wing apiece.

There is even talk in Heaven of taking away wings from the Old Timers and giving them to the new arrivals—No recaps—no retreads. This is just a tip so if you P. P. E. guys expect to do any flying in the Hereafter, you'd better bring along your own wings.

Can you gentlemen please do anything for a Devil who is definitely down on his luck? If you should have any practical ideas, I can use 'em; should you boys come to see me—things being back to normal—I'll give you the best darn bake Hades can provide.

Yours from the abiding place of misery whence the boarders and the B.t.u.'s are fleeing in ever increasing numbers.

SATAN

For Victory
BUY U.S. WAR BONDS
Also for Victory — keep your plant going at full capacity. Avoid frequent shut-downs. Use packings, gaskets and oil seals which give long, dependable service.
THE GARLOCK PACKING COMPANY
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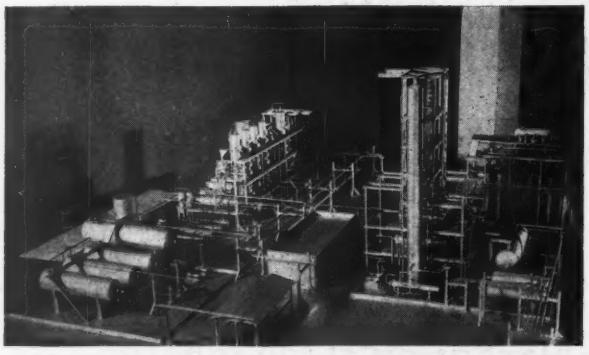
GARLOCK
The Standard Packing of the World

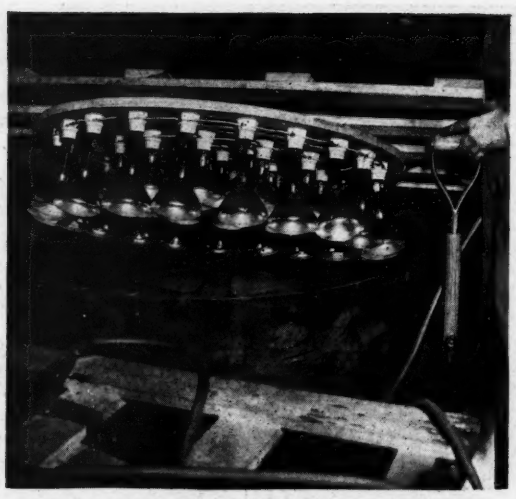
SHOP TALK

A department showing by means of photographs how engineers in various plants have overcome certain obstacles or devised methods to facilitate operation. If you have done something along similar lines that you are proud of or which you feel may be of interest to others, send us a picture and a paragraph of explanation. If the photograph is good and if the idea is original we will present it on this page and pay you for it

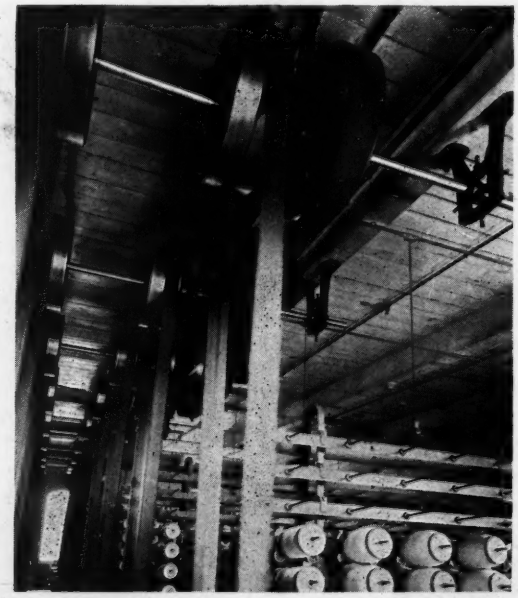


PLANT MODEL. Model of polymerization plant unit recently put in operation by a large Eastern refinery as part of its octane number improvement program. The plant is arranged for non-selective operation and is understood to be the world's largest polymerization plant yet built.

METAL RECOVERY. Non-ferrous metal recovery from floor sweepings is complicated by the large amount of ferrous metals and dirt involved. Scrap from Westinghouse plants near Pittsburgh is shipped to the Linehart Works which recovers some 850,000 lb. monthly. Sweepings are mixed and lumps reduced in a March ball mill from which the fins overflow to a concentration table. Metal particles collected in the riffles of the table is the pay dirt. Dirt carried over by the water to the three settling tanks is then removed periodically to a central dump.



INFRA-RED MOLD DRYERS. C. W. Peterson, Assistant Production Manager of the Dodge Mfg. Co., Mishawaka, Ind., has found infra-red lamps much superior to torches for skin drying of molds. The infra-red dries the blacking with which the mold is covered with a hard skin and also eliminates the cracking of the mold surface. 250 watt lamps on 6 in. centers, placed 6 to 10 in. from the mold surface dry the face to a depth of about one inch in 45 min. The kilowatt hour consumption per square foot is less than one. This new method permits duplication of good results, prevents damage to molds due to excessive drying and is particularly well adapted to wood flasks, but either kind is satisfactory.



CUTS POWER A THIRD. Once upon a time—not so long ago—the International Braid Co., Providence, R. I., was having trouble: 50-hp. motors driving twisters and spinning frames were overloaded up to 72-hp.; belts slipped and wore out too fast; oiling was a weekly chore; and the plant had to warm up slowly because of high starting torques. Then, V-belts were installed from the motors to the main jackshafts; jackshafts, intermediate and outside shafts were fitted with Fafnir ball bearing hanger boxes. Results—motor loads dropped from 72 to 48-hp. per group; greasing was needed only once in 6 mo.; starting trouble stopped; production boosted 5 per cent.

...but UNFIT for Industrial use

WATER as it occurs in nature may be sparkling and clear—it may even be pure enough to drink—but without conditioning, it is rarely suitable for either power or processing needs.

Betz is an organization of engineers and chemists trained and skilled in detecting and correcting all qualities of water that might limit its usage for any particular water application. Betz service includes Consultation, Plant Studies, Plant Design and Service Supervision for Boiler Water, Process Water, Municipal Water, Waste and Sewage Disposal.

Now, as never before, with industry under the necessity of attaining the utmost in production with available plant and personnel, the matter of correct water conditioning becomes of primary importance. In this vital field Betz stands ready to render a complete service—of consultation, research, design and supervision.

★ **The Betz Indicator** *is a monthly publication devoted to the chemistry and practical applications of water conditioning. It will be mailed without charge at your request.*

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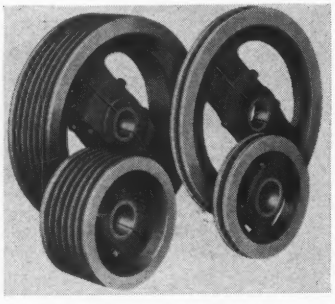
New Equipment

Information that you desire about any equipment will be gladly furnished without obligation. WRITE POWER PLANT ENGINEERING.

Wood Sheave V-Belt Drives

THE "VICTORY" Wood Sheave for V-belt drives is offered as an alternate for metal sheaves by Dodge Mfg. Corp., Mishawaka, Ind. The efficiency of this sheave is said to be equal in every way to that of metal sheaves except where fly-wheel effect is essential. It is of laminated construction and the segments are of selected straight-grain kiln dried hard maple. Wood bushings are provided and provision is made for firm fastening to shaft.



The introduction of this sheave makes it possible for users of V-belt drives to aid in the conservation of metals needed for the manufacture of vital war material and it also will release equipment formerly required for the manufacture of metal sheaves, for other war production.

These sheaves are offered in composite groove types for A and B section belts in a full range of sizes and for B belts in sizes from 5.4 p. d. to 38.0 p. d. up to 10 grooves, and for C belts from 5.4 p. d. to 44.0 p. d. up to 12 grooves.

Static-Discharging V-Belts

ANNOUNCEMENT made by The B. F. Goodrich Co., Akron, Ohio, a short time ago introducing new lines of static-discharging and oil-resistant V-belts, in all sizes of A, B and C cross-sections and previously made only on special orders, are now available.

Belts of ordinary compounds are nonconductors and will accumulate a static in the form of a spark, which, in the presence of inflammable or explosive mixtures is a serious explosion and fire hazard. Approximately 20,000 v. are necessary to create a 1-in. long spark in dry air, but voltages much greater than this are common.

Grounded metal chains and brushes in common use with the old-type belts are effective when in perfect condition. They are subject to wear, misadjustments and accidents, and there is difficulty in providing proper contact with all the belts on a drive.

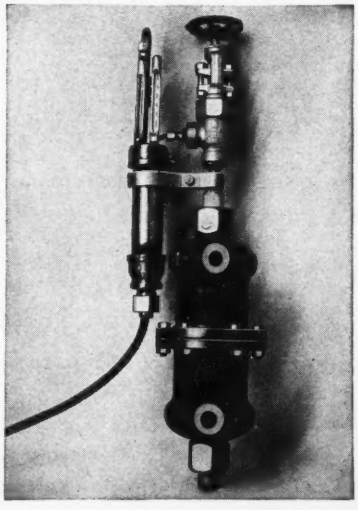
The static-discharging V-belt accomplishes its function through the use of a rubber in the belt covers so compounded as to conduct electricity. Static charges are not built up because the electricity flows continuously through the belt to the sheave and out through the frame of the machine. When the machine is grounded, no possibility of sparking is present.

The belt cannot become a path for a short-circuit because of a constant dissipation of static it does not have sufficient conductivity to act as the bridge for a short-circuit between motor, the machine and the operator.

The static-discharging V-belt retains its qualities of static dissipation because these properties are built into the rubber compounds, and the belt keeps these characteristics throughout its normal life or until the covers have been worn away.

Condensate Sampler

ROUTINE checkup of boiler water concentration or steam condensate by electrical-conductivity means is said to be reduced to simplest terms with the condensate sampler recently developed by Industrial Instruments, Inc., 156 Culver Ave., Jersey City, N. J.



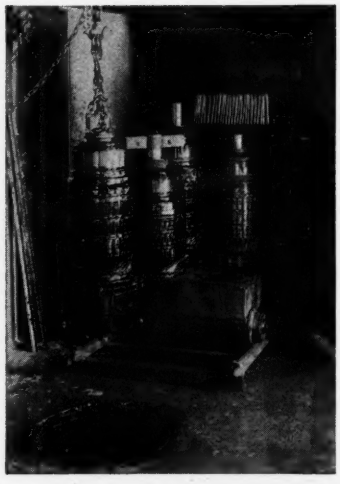
This device is also said to provide an accurate means of sampling condensate for a conductivity cell which in turn connects electrically with a suitable measuring or checking instrument calibrated in direct-reading terms such as percentage of carry-over or soluble salts. Or, by means of a suitable device, a warning signal is automatically actuated when condensate exceeds set limits, or a corrective means is automatically set in motion.

The conductivity cell holder alone is for use with any type of condensate cooler, or in combination with a new type of condensate cooler. The cell holder admits the condensate or cooled boiler water through its ¼ in. solderless pressure-connected copper pipe. An outlet pipe with a two-way control cock releases the condensate to the drain pipe. A neoprene baffle insures the proper circulation of the condensate past the conductivity cell and a thermometer indicates temperature of the condensate while a sight gage shows up the presence of any oil in the condensate, which oil might be due to turbines or other lubricated equipment in the steam or vapor system being checked. To prevent such oil from contaminating the conductivity cell, the two-way drain cock is turned so as to expell the oil.

The conductivity cell holder alone can be used with existing condensers, such as degasifying sample condensers. The conductivity cell holder alone, without cell, lists at $32; the sample cooler complete, $63; the complete sample cooler, conductivity cell holder, the conductivity cell, $111.

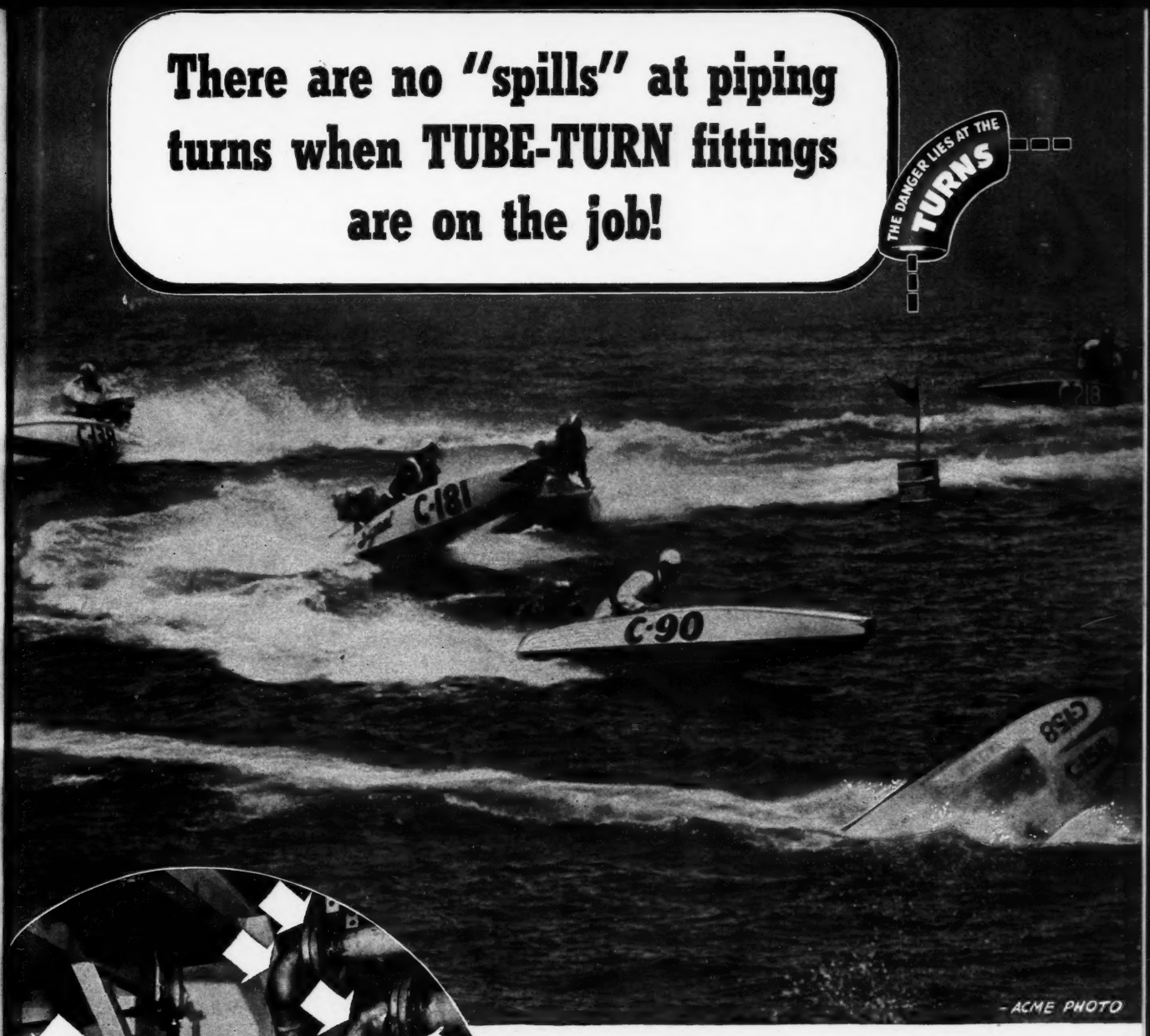
Insulating Varnish

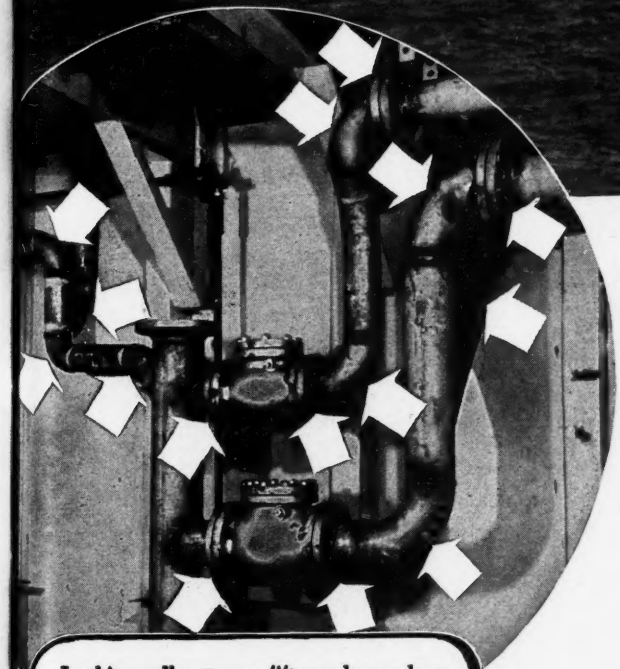
THE STERLING VARNISH CO., 166 Ohio River Blvd., Haysville, Pa., has recently developed a new insulating varnish, designated as S-110, for application to electrical apparatus that must operate at abnormally high temperatures. Stated tests have indicated that S-110 will stand operating temperatures at 250 deg. C. or higher. When baked at 175-200 deg. C. it is said to dry all the way through the deepest winding and not resoften when exposed to high operating temperatures. The dried film is mechanically strong, exceptionally adhesive and flexible, and retains these characteristics under adverse heat conditions.



The same company has a colorless liquid sealer for leaks in concrete walls, tunnels, floors, tanks and pits. The chemical is mixed with ordinary Portland cement, moulded into a carrot, and forced into the opening. Where dampness or seepage exists, a plaster coat of the same material may be applied.

There are no "spills" at piping turns when TUBE-TURN fittings are on the job!





In this small area are *fifteen* places where Tube-Turn welding fittings and flanges are on the job—giving full protection against leakage and other maintenance worries. In any complete piping system, figure the hundreds of points where flow direction changes, and you'll see why Tube-Turn returns, elbows, tees, reducers, laterals, nipples, caps and flanges offer extra protection and trouble-free piping.

Disaster at the turns is an old story—

With spray flying and motors roaring, speed boats hurtle around the buoy-marked racing turns at break-neck speed! Cutting the curves too sharp or too fast means an upset—another case of failure at the turns.

The same danger lies at turns in *piping systems.* Wherever there is a change in flow direction, the strain imposed by the flow speed and pressure increases the probability of leakage and failure unless they're *welded* and *protected* with Tube-Turn welding fittings!

Write for helpful Tube-Turn data book and catalog.

TUBE-TURNS, INC., Louisville, Ky. *Branch offices:* New York, Chicago, Philadelphia, Pittsburgh, Cleveland, Tulsa, Houston, Los Angeles. *Distributors in all principal cities.*

TUBE-TURN TRADE MARK — The FIRST WELDING FITTINGS 1ST AND STILL THE BEST — *Welding Fittings*

WARREN PUMPS HAVE RESERVE CAPACITIES

EVEN though Warren Pumps are "built to fit the job"—to operate at a certain capacity—they are frequently asked to step up their capacities to meet increased production needs. *And Warren Pumps are able to meet these new demands* because of the way they have been designed and built.

Here are some of the design-facts of a Warren Pump that helps explain its reserve capacity . . . liberal clearances between impeller and case-rings, extra-heavy shafts, over-size bearings, carefully proportioned liquid passages.

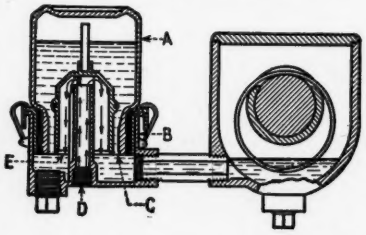
Investigate these Warren features for yourself—if you want pumps that can do *more* than their share.

WARREN PUMPS

WARREN STEAM PUMP CO., INC., WARREN, MASSACHUSETTS

Constant Level Lubricator

FOR PROTECTION of today's vital machinery a new Oil-Rite Constant Level Lubricator is announced by the Oil Rite Corp., 3466 S. 13th St., Milwaukee, Wis. It holds a visible reserve supply of oil — releases automatically just as much as is needed to maintain a constant predetermined level of lubricant. Its use is said to insure adequate lubrication at all times, and, prevent oil waste, and the deterioration or spoilage of material caused by oil throw.

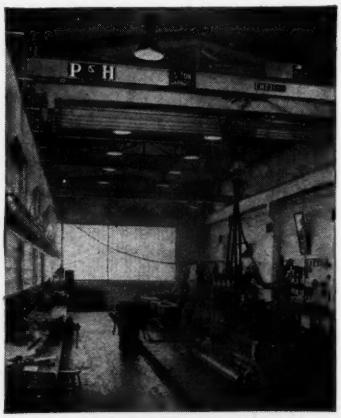


This lubricator is used on electric motors, pillow blocks, textile and paper making machinery, pumps, air conditioning equipment, ventilating fans, gear boxes — wherever bearings and other machinery parts must be provided with an ample supply of lubrication.

When the reservoir — (A) in the accompanying diagram — is filled and inverted into position on the base (B), the lower edge (E) of the inverted bucket or bell determines the oil level which the lubricator will maintain. When the level falls below this point, air from the vent (D) escapes under the side of the bell—as at (C) — up to the top of the lubricator, permitting oil to flow down until the level to be maintained again seals across the base of the bell. Operation is entirely automatic — employs no moving parts of any kind. The lubricators are available in four standard sizes, with capacities of 2, 4, 8 and 16 oz.

Cranes

THE HARNISCHFEGER CORP., Milwaukee, Wis., announces that Trav-Lift cranes will include two added features as standard equipment.



Double I-beam cranes employing a motor driven trolley will be equipped with a drag brake on the trolley. All cage controlled Trav-Lifts will be furnished with a foot gong.

The cranes are made in capacities up to 15 t., are for supplementary usage with the large overhead traveling cranes.

DON'T LET RUST

"PUT THE FINGER" ON YOUR TURBINES

Don't wait until rust causes costly shutdowns. Refill your turbines now with new, rust-preventive Shell Turbo Oil. It meets, not just one or two, but all *three* requirements of modern turbine lubrication . . .

RUST PREVENTION
SUPERIOR OXIDATION STABILITY
MINIMUM FOAMING TENDENCY

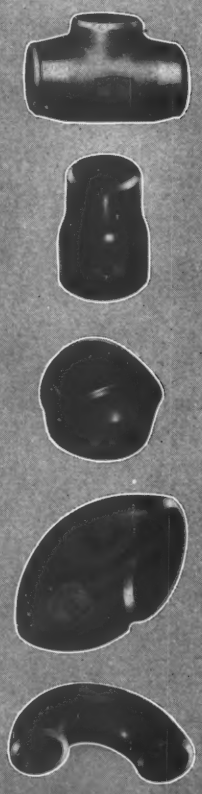
Don't "put up" with any oil that does less. Use new, tested and proved Shell Turbo Oil. Call in Shell now for details.

SHELL

Lubricate with *New* Rust-Preventive **SHELL TURBO OIL**

Minutes here save hours later!

From 3/4" to 24"



Every hour saved in the erection of your welded piping means just that much more time for essential wartime production. And Grinnell Welded Fittings are precision-engineered to save time on every welded joint!

The illustration shows one typical operation in Grinnell's precision production. In this exclusive process, outlets of all tees and crosses are accurately extruded . . . full wall thickness is maintained . . . field welding is limited to plain circumferential butt welds, the quickest-to-make and strongest welded joints.

Grinnell Welding Fittings arrive on the job exactly *metal-matched* and identical in end-thickness with the pipe or tubing you select. They are accurately dimensioned to specifications, with ends correctly scarfed. You get quicker, better welding . . . joints that pass inspection easily and remain trouble-free.

Save time for all-out production by specifying Grinnell Welding Fittings. Write for complete Data Book. Grinnell Company, Inc., Executive Offices, Providence, Rhode Island. Branch offices in principal cities of United States and Canada.

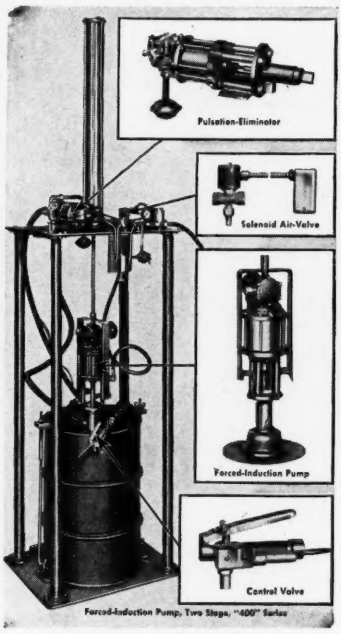
WELDING FITTINGS BY

GRINNELL

WHENEVER PIPING IS INVOLVED

Forced Induction Pumps

FORCED induction pumps, known as Pile Drivers, are designed to dispense heavy, viscous materials such as sealing compounds, sound deadeners, insulating materials, putty, heavy lubricants and other substances too heavy and solid to prime in any other type pump.



These pumps, manufactured by Lincoln Engineering Co., St. Louis, Mo., are available in single or two-stage models, both employing the Lincoln air-motor. Two sizes can be furnished, one for pumping materials from containers up to 10 gal. capacity, and the other for pumping material from 55 gal. drums. Each can be arranged as a single or two stage unit, depending on the requirements. The single stage unit is for use where the pulsation in the flow of material is permissable. The two stage unit has a pulsation eliminator which does away with the pulsation and delivers the extruded material at an even rate of flow and in uniform size and shape as desired. The delivery of materials in both models is controlled by a hand operated shut-off valve at the outlet and is always under control of the operator. A few of the features of these units are illustrated in the photograph.

New Type Enclosed Motor

ESPECIALLY ADAPTED for use in dusty locations, the Crocker-Wheeler Electric Mfg. Co., Ampere, N. J. has a newly designed fan cooled motor wherein the ventilating air is blown over the external ribs, and is not forced through internal passages. It is stated that trouble-free operation is assured even in atmospheres containing excess amounts of destructive fumes, abrasive dust, oil or dirt. Motors are built in standard N.E.M.A. frame sizes up to 20 hp., either ball or sleeve bearing equipped. The latter construction is of particular appeal to manufacturers and users of precision tools where delicate balance and freedom from vibration are essential.

Why did **SIX** tubes crack . . . and no more?

ANOTHER UNUSUAL STORY OF HALL SERVICE

TIME: Early last year.

PLACE: Hall-client boiler plant.

TROUBLE: Four-drum, bent-tube-type boiler being returned to service after ten-year shutdown—six tubes in No. 5 row between back top and bottom drums found severely cracked transversely at upper-end tube seats. Boiler inspector and plant superintendent feared cracking was of embrittlement type. Familiar with embrittlement detectors through discussions issued by Hall Laboratories, superintendent ordered a detector to find out if water had embrittling characteristics.

HALL ANALYSIS: Trouble-shooting Hall service man inspected boiler and cracked tubes—searched particularly for special conditions of possible significance. Only six tubes in No. 5 row were cracked, distributed evenly across the row, *not* confined to any one section. Gas baffle between middle and back drums was supported partly on special tubes—No. 22 row—partly by clamps around six tubes in No. 5 row. Cracked tubes all failed in same relative location—circumferentially within the seat—in each case on tube fronts. *The six tubes that cracked had been those which supported the baffle!*

SOLUTION: When baffle was first installed, supporting clamps were so attached that expansion imposed excessive stress on tubes at their upper seats. Now, with baffle attached to six new tubes in a way that prevents excessive stress, no more trouble has occurred. Nevertheless, use of embrittlement detector will prove whether or not water is embrittling in character—a particularly interesting case because there is plenty of sulphate in the water to maintain the constant ratio of sulphate to alkalinity recommended by the A.S.M.E. code for protection from embrittlement.

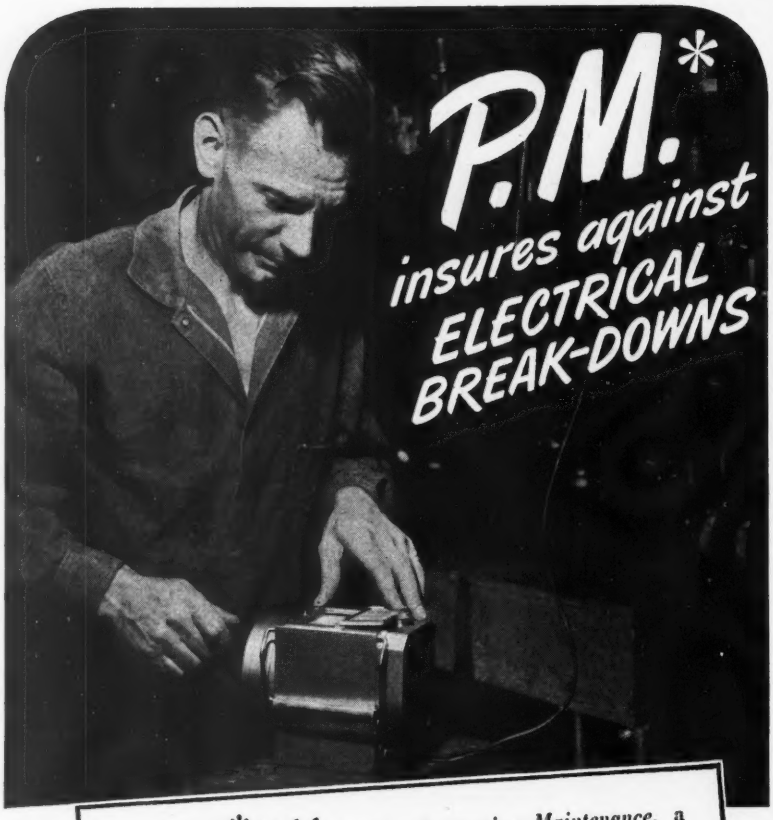
What Hall Service can do for you

Hall Service means far more than just water conditioning. Hall Engineers help you keep your plant *in operation*, whether the problem is one of scale, corrosion or embrittlement in your boiler, or any of several other difficulties encountered both inside and outside your power plant.

This kind of service is particularly important in times like the present, when new equipment is difficult, if not impossible, to secure. Call in a Hall Service Engineer for a thorough check-up of your boilers. You will be infinitely better equipped to prevent troubles before they cripple your plant—at a time when you have *got* to make the *most* of what you *have*.

HALL LABORATORIES, INC. · HAGAN BUILDING · PITTSBURGH, PA.

HALL SYSTEM *of Boiler Water Conditioning*



*P.M. is for *Preventive Maintenance*, a term which aptly covers the periodic use of "MEGGER" Testers for checking the condition of insulation in generators, wiring, motors and other electrical equipment. Incipient insulation troubles are thereby detected and isolated . . . and corrective measures can be taken *before* major failures occur. As a consequence, damage or destruction of valuable equipment is prevented and priceless production time is saved. Preventive Maintenance is obviously more practical than permitting insulation to break down—and then hold a Post Mortem to determine the cause.

If you are already familiar with the "MEGGER" Testers and what they do, you most likely have one in your plant. Plan to use it systematically. It is your ounce of prevention against costly electrical breakdowns.

Do you have our Pocket Manual of "MEGGER" Practice? If not, write for a free copy of Manual No. 1420-PE.

JAMES G. BIDDLE CO.
1211-13 ARCH ST. • PHILADELPHIA, PA.

"MEGGER"
TRADE MARK REGISTERED U.S.PAT. OFF.
Insulation Testers, Ground Testers and Ohmmeters

Thermometer

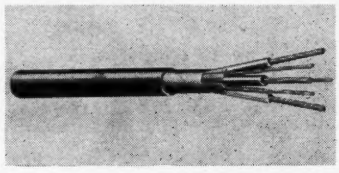
A NEW 5-in. industrial thermometer for use in a limited space or on equipment subject to vibration has been developed by the Taylor Instrument Cos., Rochester, N. Y., and is applicable to Diesel engines, air compressors, lubricating lines on motors, generators or reduction gears, small diameter brine, steam or water lines, and many other applications.

It is of one-piece construction and eliminates separate front or top caps which might loosen under vibration. The thermometer offers two types of separable socket connections, making it easy to install and remove; choice of connection offered to suit the application. It is available in straight, angle, right side angle, left side angle, or oblique stems to afford best angle position for any location.

Flamenol Bus-Drop Cable

A NEW non-rubber flexible Flamenol bus-drop cable for 600 v. branch circuits has been announced by the General Electric Co., Schenectady, N. Y.

Connection from bus to machine can be made at a saving in installation time and materials. Using no rubber, it requires no conduit. One end of the cable is inserted into a knockout of the plug-in box of the bus system, by using a conventional squeeze-type fitting. This type of fitting can be used because the



Flamenol cable has properties of high resistance to oils, acids, alkalies, and coolants. The cable is then run horizontally to a point above the machine, is looped through, and is supported by a porcelain spool insulator connected to a supporting wire.

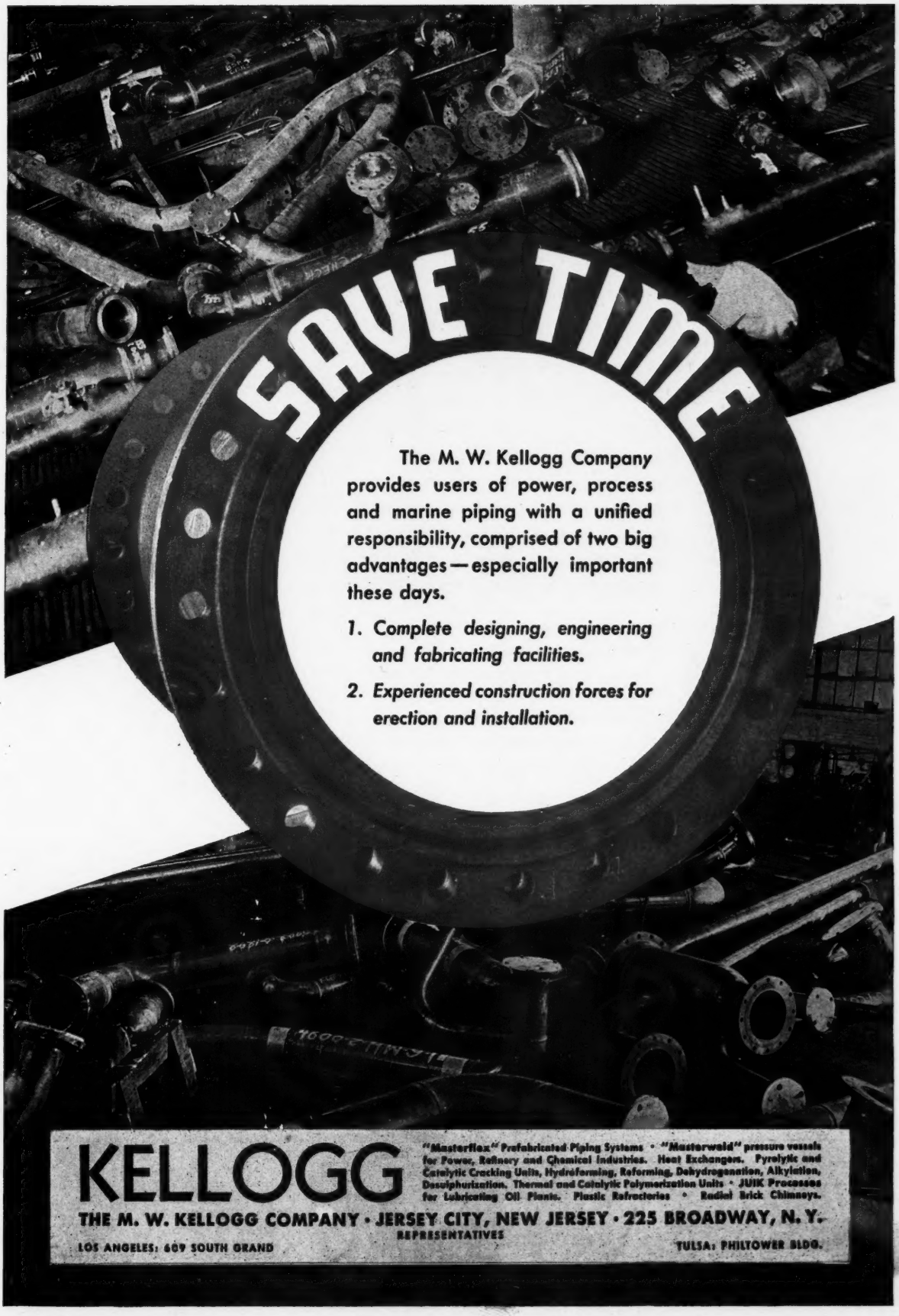
This non-rubber bus-drop cable is said to be highly resistant to oils and coolants and will not support flame. It is easy to bend, and is resistant to abrasion.

Blast-Cushioning Glass Fiber Material

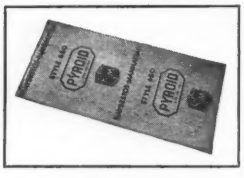
BLAST-CUSHIONING, incombustible glass fiber material for blacking out has recently been developed for war production plants, it was announced by the Owens-Corning Fiberglass Corp., Detroit, Mich. The material is designed to reduce damage from concussion and to provide protection against the spread of fire caused by incendiary bombs or explosives.

Known as Fiberglass OC-9 Board, the new material is composed of fine, resilient glass fibers compressed and treated with a binder which gives it sufficient rigidity to serve as a self-supporting, fire-resistant material. The material can be faced with fiber glass cloth, plywood, or other surfacing materials.

In addition to their incombustibility


SAVE TIME
The M. W. Kellogg Company provides users of power, process and marine piping with a unified responsibility, comprised of two big advantages — especially important these days.
1. Complete designing, engineering and fabricating facilities.
2. Experienced construction forces for erection and installation.
KELLOGG
"Masterflex" Prefabricated Piping Systems • "Masterweld" pressure vessels for Power, Refinery and Chemical Industries. Heat Exchangers. Pyrolytic and Catalytic Cracking Units, Hydroforming, Reforming, Dehydrogenation, Alkylation, Desulphurization. Thermal and Catalytic Polymerization Units • JUIK Processes for Lubricating Oil Plants. Plastic Refractories • Radial Brick Chimneys.
THE M. W. KELLOGG COMPANY • JERSEY CITY, NEW JERSEY • 225 BROADWAY, N. Y.
REPRESENTATIVES
LOS ANGELES: 609 SOUTH GRAND
TULSA: PHILTOWER BLDG.

Production can be *Safely Speeded Up* with R/M PACKINGS



Because they have always been made a little better than necessary for ordinary production, R/M packings can now be depended upon to provide an extra measure of protection in war industries where production has been speeded up.

Naturally, there is a limit beyond which no machines or materials can be pushed. But R/M engineers are aware of the strains and stresses to come and are working to make R/M packings to meet the emergency. You can depend upon them in the future, as you have in the past.

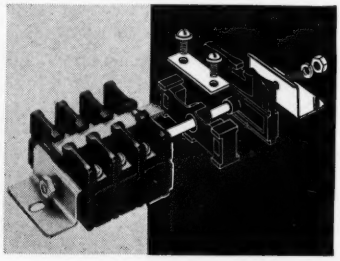
Meanwhile, it will be helpful to you to have a copy of the R/M keyed, illustrated and indexed catalog in which you can quickly find the right packing for practically any ordinary industrial application. Get a copy from your R/M distributor or write us direct.

INDUSTRIAL SALES DIVISION
RAYBESTOS-MANHATTAN, INC.
MANHEIM, PA.
BRIDGEPORT, CONN. NORTH CHARLESTON, S. C PASSAIC, N. J.
Makers of Packings for Every Industrial Use

and shock-absorbing properties, all of the glass fiber products designed to contribute to the air-raid protection of industrial plants provide a high degree of heat loss reduction and sound absorption. Both of these latter properties are important to the war economy because of improved working conditions and fuel savings which they make possible.

Terminal Blocks in Kit Form

THE CURTIS DEVELOPMENT & MFG. Co., 1 N. Crawford Ave., Chicago, Ill., manufacturers of the Curtis built-up terminal block, are now supplying the blocks in kit form, or sets of parts unassembled.

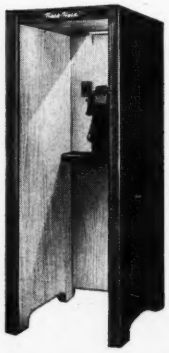


The parts have been assembled in two kits. The CDM-100 contains 50 center barriers and terminals while the CDM-101 kit contains five sets of end barriers, mounting brackets, marking strip, threaded through rod and other necessary hardware.

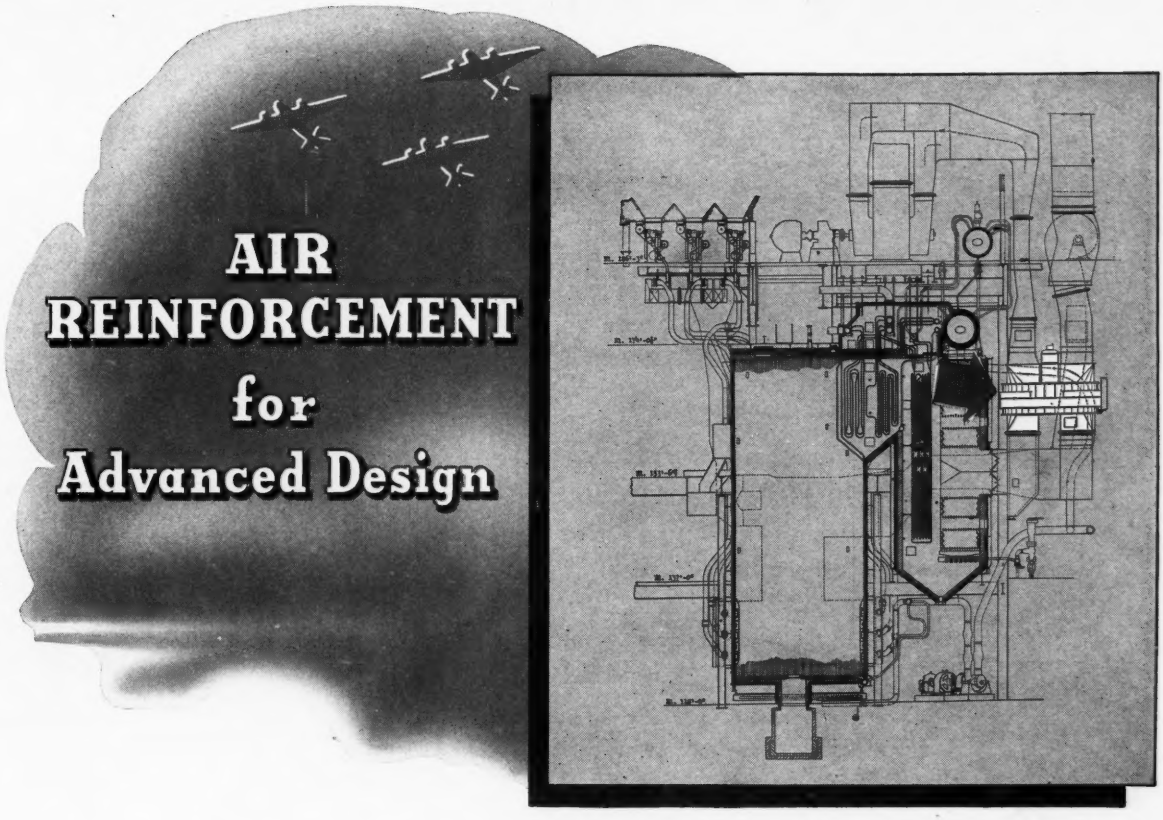
The moulded parts are said to have a tensile strength of 4000 psi. The voltage breakdown at 60 cy. (50 per cent relative humidity) is approximately 375 v. per mil.

Industrial Model Acousti-Booth

A NEW WOODEN Acousti-Booth is announced by the Burgess Battery Co., Acoustic Division, 2825 W. Roscoe St., Chicago, Ill. This new booth is part of the line of wooden booths being developed to enable the company to supply industrial users without priorities or other restrictions. These booths conserve steel for national defense because no critical materials are used in their construction.



The walls and ceilings in the new Acousti-Booth are constructed of heavy reinforced birch plywood panels, filled with a thick blanket of sound-absorbent material. The inside walls of the booth consist of a heavy perforated plywood facing, which protects the sound-absorbent material. This combination of per-



Efficiency of new high-pressure, forced-circulation boiler is backed up by Ljungstrom Air Preheater

The advanced design of this steam generating unit now under construction for a leading New England utility company includes a forced-circulation boiler designed for 2000 psi. Capacity of the unit is 650,000 lbs. of steam per hr. at 960 deg. F. temperature. The combustion conditions needed for efficient operation of such a unit are reinforced by air preheated to 531 deg. F. As gases enter the Ljungstrom Air Preheater at 642 deg., leave at 290 deg., a high degree of heat recovery is also assured.

• • • • •

Check over the jobs that represent a definite advance in steam plant design . . . the ones that involve the most careful and critical study of every element affecting efficiency . . . and you're almost sure to find a Ljungstrom Air Preheater included. Records of *all* plants above 150,000 lbs. steam per hr. purchased for public utility service last year, show the Ljungstrom to be the majority choice. The large number of "repeat" purchases in this group is another meaningful sign.

Today, all the normal factors favoring this type of preheater are reinforced by its *conservation* features: Ljungstrom Air Preheaters average *one-half* to *one-third* the weight of other types for the same degree of heat recovery, saving important quantities of steel both in the unit itself and in the supporting structure. Moreover, the regenerative heating surface used in the Ljungstrom is of an easily fabricated type, not affected by current shortages in heavy plate and tube production.

A new booklet, "Another Kind Of Air Power With A Wartime Job To Do" tells the story of conservation with the Ljungstrom, and reports on the performance of several installations now in wartime service. Write for your copy.

THE

AIR PREHEATER

CORPORATION

Executive Offices: 60 East 42nd Street, New York, N. Y. • Plant: Wellsville, New York

QUICK QUIZ

FOR POWER ENGINEERS

Castable Refractories important in power plants today...quickly available for boiler settings, special shapes and emergency repairs. Read why engineers and superintendents specify castables made with LUMNITE.

What Is a Castable Refractory? A dry mixture of refractory aggregates and cement, packed in waterproofed bags, and delivered ready to use.

How Do You Use It? You simply mix the castable with water and cast it in place, to form monolithic refractory linings —or mold it into precast shapes of many kinds. Castable Refractories have high cold-strength as result of hydraulic bond formed in a few hours after mixing with water. No heat is required to cause bonding action.

Where Can You Use Castable Refractories? Among the many uses in a boiler plant are for baffles, door linings, arches, bridge walls, burner blocks, stoker settings, and ash pits.

What About Special Shapes? You will find it easy to make your own special shapes and keep a stock on hand for emergency replacement when breakdowns occur. Why take chances on delays in delivery of specials when time is too valuable today to waste in shutdowns?

Are There Different Types of Castable Refractories? Yes, some manufacturers make several types to meet different temperature and insulation requirements. Each type can be used for many kinds of installations.

Is Installation Easy? A Castable Refractory handles as easily as ordinary concrete. *No cutting and fitting.* It takes the shape of the form, mold, or frame in which it is cast—without ramming.

What About Shrinkage? There's practically none in drying out or during firing. You fill a door frame solid without allowance for shrinkage or expansion. Moisture and steam do not affect castables.

Advantages of Cast-in-Place Castables? They make a one-piece wall and lining of ordinary size, with no joints to let heat out and air in—no ridges or grooves to catch and tear.

What Is the Binder in Castable Refractories? LUMNITE, a high-alumina hydraulic cement, resistant to heat.

Why Is LUMNITE used? LUMNITE develops high cold-strength quickly and fired-strength in refractory mixtures at high temperatures.

Where Can You Get Castables? They are easily available from distributors of mill supplies and firebrick everywhere.

▶ The Atlas LUMNITE Cement Company (United States Steel Corporation Subsidiary), Chrysler Bldg., N. Y. C.

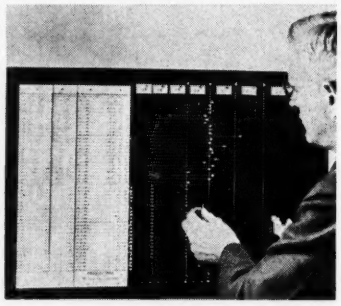
Specify **CASTABLE REFRACTORIES**

MADE WITH LUMNITE

forated plywood and the sound-absorbent material which it protects is a patented Burgess development. These acoustic panels blot up factory noise and create a remarkable "zone of quiet" in the booths. Outside dimensions are 30 in. wide by 79½ in. high by 38 in. deep. The front opening is 24 in. wide. Approximate shipping weight is 225 lb.

Material and Labor Tabulator

To ENABLE production and purchasing executives to have a more intimate knowledge of materials, parts, assemblies, machine and man hours, the Wassell Organization, Westport, Conn., has an-



nounced a new control device known as the Produc-Trol. The items are listed at the left of the board, and movable tapes working from left to right bring all pertinent facts into instant focus. Comparative data and control for any operation is readily available.

Switchgear in Metal-Enclosed Cases

GENERAL ELECTRIC'S 250-v. d.c. air circuit breaker switchgear equipment for heavy duty in steel mills, shipyards, and various industrial applications is now available in metal-enclosed cases, thus eliminating the possibility of inadvertent contact with live parts.

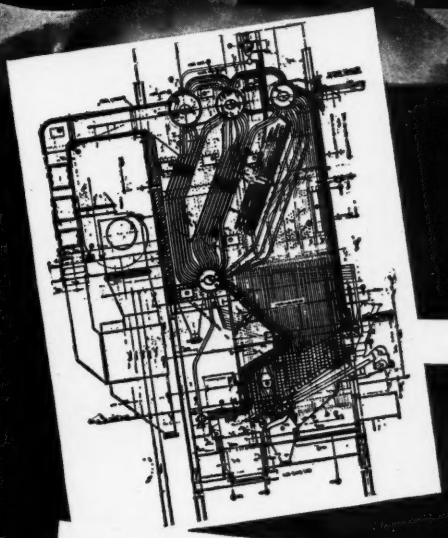
This latest development gives new safety features to the MC-5 breaker, formerly available only in the live-front construction. This breaker can be installed without the additional safeguards previously required in many locations. The individual air circuit breakers, of the MC-5 type, are enclosed in separate steel compartments, as are the control devices of the contactor. Control switches and instruments are mounted semi-flush on the doors to the control device compartments. Arc chutes designed to direct gases from circuit interruption lead out from the top of the structure and away from the operating area. Panels of the new equipment can be locked, and the interior accessible only to authorized persons for inspection.

Insulating Varnish

TO MEET COIL insulation requirements of generators a new insulating varnish which is said to withstand high temperatures has been announced by Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa. The new product known as Thermoset is a varnish of a synthetic resin type, cured by heat induced chemical polymerization.

Of low viscosity, the varnish will not skin over or gum up new equipment with an insoluble film. It is said to penetrate

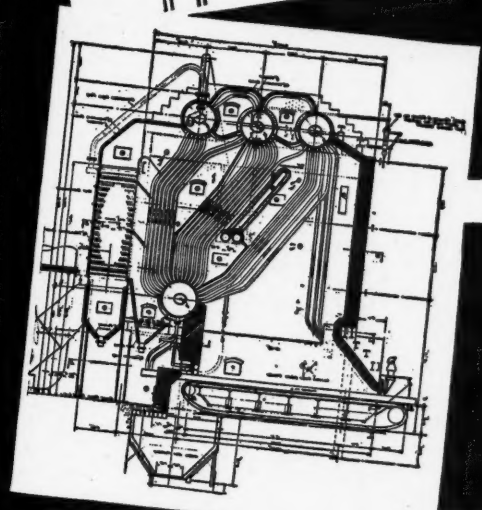
STEAM *for*



POWER

SOUTHERN COLORADO POWER COMPANY
Pueblo, Colo.

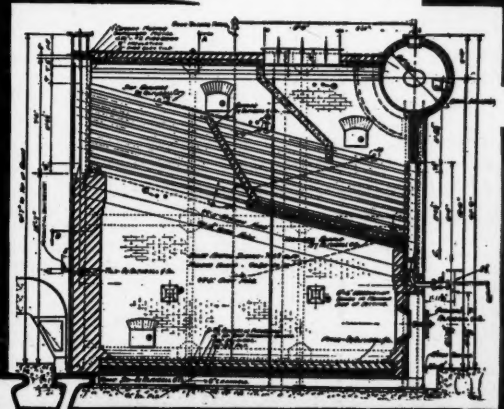
90,000 lbs. steam per hour Vogt LE type bent tube boiler with underfeed stoker. Water walls and economizer. Design pressure 525 lbs. Total steam temperature 750 degrees F.



PROCESS

IN A LARGE MID-WESTERN STEEL MILL

Two 105,000 lbs. steam per hour Vogt LE type bent tube boilers with chain grate stokers and economizers. Design pressure 225 lbs. Total steam temperature 550 degrees F.



HEATING

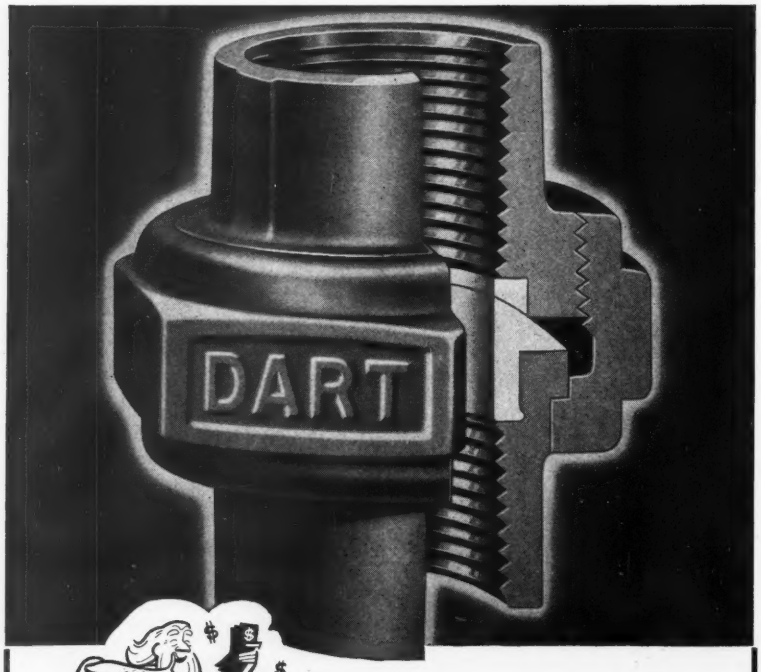
CRIMINAL COURTS BUILDING AND JAIL
New York City

Four Vogt sectional header type boilers of 47,000 lbs. steam per hour capacity, oil fired. Design pressure 200 lbs.

HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY
Branch Offices: NEW YORK CLEVELAND CHICAGO PHILADELPHIA DALLAS

Vogt *Water Tube* BOILERS

BENT TUBE AND SECTIONAL HEADER TYPES



CASH IN on the EXTRA Dart Dividends

. . . Find and Use your Old Dart Unions again

You're in luck **if you have some "retired" used Dart Unions around your plant. Why? Because you can put them back on the job with the assurance that the equipment will again give "tight as new" dependability.**

The extra dividends that Dart Unions pay in trouble-free performance and long life are due to their special features. Matched bronze seats, ground to "true-ball" surfaces makes it possible for Darts to be used again and again, with "first-time" tightness. Nuts and bodies made of air refined malleable iron give Dart Unions the ability to take rough handling, resist pipe strains and corrosion.

Make a search of your plant to get the extra dividends of *old* Dart Unions. See your supplier for the extra dividends of *new* ones.

DART UNIONS

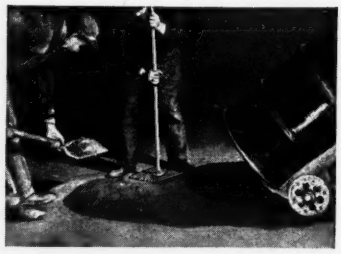
E. M. DART MFG. CO., PROVIDENCE, R. I.

the deepest windings to completely fill the interior voids. Water and oil proof, the varnish is unaffected by acids and alkalies in ordinary concentration.

The unit to be insulated is soaked in the varnish until all bubbling has ceased, then it is drained and baked at 275-300 deg. F., until thoroughly cured. Baking time depends on the size of the unit and usually ranges from 6 to 24 hr.

Floor Resurfacer

WITH THE development of a new ready-to-use material called Instant-Use-Resurfacer, by the Flexrock Co., Philadelphia, Pa., patching or overlaying a rut



in a floor can now be done successfully without any delay to trucking or other heavy use. This material adheres to old concrete or wood, and bonds, it is claimed to a feather edge.

Black Cable Paint

THE JOHN C. DOLPH Co., Newark, N. J., has recently developed a black cable paint with weather resisting properties. This paint, known as No. 737 Black Cable Paint, is said to be oil and waterproof, extremely flexible and flame resistant 1 hr. after application and also highly resistant to corrosive fumes and heat.

For application to all cables, such as power, control, degaussing, motor leads, splices, etc., the black cable paint is supplied at heavy brushing consistency and provides a build up of 8 mils per coat. Air dries in 15 min. and may be thinned when necessary.

Protective Coating

CHEMPRUF, a protective coating which the manufacturers claim is impervious to acids and alkalies in any concentration and at any temperature, is announced by Protective Coatings, Inc., Detroit, Michigan. The coating is designed as a substitute for rubber and synthetics and comes in liquid and plastic form.

Bomb Fighter

A NEW BOMB SHOVEL, developed by two employes of Los Angeles Shipbuilding and Drydock Co., for fighting incendiary bombs has been recently announced by Industrial Maintenance Engineering Co., Ltd., 724 S. Spring St., Los Angeles, Cal.

The shovel carries a load of sand in the handle to smother the blazing incendiary. Made of galvanized sheet metal and weighing only 17 lb. when loaded, it may be handled by untrained employes and can be carried to roof of a building. User is always 4 to 5 ft. from burning bomb. Sand is automatically released from handle after operator has used hollow side of shovel to smother blazing bomb. Raising shovel slightly causes sand to pour out of handle and smother bomb. Shovel is then turned over and used to

SURFACE CONDENSERS
FEED WATER HEATERS
EVAPORATORS EJECTORS

BY

LUMMUS

As a leading designer and builder of complete refineries, Lummus was for years the largest single purchaser of heat transfer equipment. In a 40,000 barrel per day refinery, for example, heat exchangers, lube oil coolers, etc., will amount to more than half a million dollars.

With a view to securing heat exchangers and similar equipment of improved design, made to even higher standards of precision and workmanship, Lummus decided to make — and for four years has been producing — heat exchange equipment for the plants it designed and built.

Recent expansion of the Lummus heat exchanger plant at Honesdale, Pennsylvania, makes available a limited capacity for surface condensers, feed water heaters, evaporators, ejectors and similar equipment for the public utility and power fields. In addition to improved design and new standards of precision, public utilities and power plants are offered the services of Lummus engineering personnel for the study of specific problems and the design and construction of Lummus-built equipment to meet definite conditions. Requests for further information will receive prompt attention.

THE LUMMUS COMPANY · 420 LEXINGTON AVE., NEW YORK, N. Y.

LUMMUS

scoop up incendiary and remove it to a safe place. It eliminates need for sand-bucket, spade, hoe or shield and is effective in smothering oil or gasoline fires.

Corrosion Inhibitor

INTRODUCING a non-oxidizing chromium inhibitor in the form of ferric salt of quachrom glucosate, for the first time, the D. W. Haering & Co., Inc., Research Laboratories in Chicago, Ill., announce development of a new corrosion inhibitor identified as ferri chrom glucosate. This substance controls corrosion in some applications in concentrations as low as two parts per million and may be employed in reducing equilibrium and at low pH values for corrosion control.

Ferri chrom glucosate is a colloidal gel which may be used for film formation in process operations by dipping or spraying, or may be incorporated in paints or lubricants for corrosion control. Ferri chrom glucosate contains very little chromium and is non-irritating to handle. Its use for corrosion applications may reduce chromium consumption for this purpose as much as two decimals at the same time providing more effective control.

Load-Center Unit Substation

NEW STANDARDIZED load-center unit substations announced by the Allis-Chalmers Mfg. Co., Milwaukee, Wis., are now available in sizes ranging from 100 to 2000 kv-a.

EXTREMELY FLEXIBLE, the standard unit substations can be installed anywhere in industrial plants or power distribution centers and offer a wide choice of incoming- and outgoing-line arrangements. The substation is compact and consists of a metal-enclosed incoming-line section, a throat-connected transformer and a low voltage feeder section.

On the high voltage side, potheads, disconnect switches, oil fuse cutouts, metal-clad switchgear or direct connection through terminal box can be supplied. On the low voltage side, stationary or draw-out air breakers, electrically or manually operated, are furnished. Transformers can be oil immersed, dry type, or non-inflammable Chlorextol liquid-filled. Standard load-center unit substations are available for either indoor or outdoor service.

6 Hand Wheel Revolutions Complete Full Vane Movement

Six revolutions of the hand wheel fully open or close this 30" R-S Butterfly Valve. Compare this quick action with ordinary valves, some of which require as many as 149 turns for complete opening or closing.

Comparatively light in weight, R-S Butterfly Valves also effect considerable savings in installation costs since less space and supporting structure are required.

Designed and constructed for regulation and shut-off duty in sizes to 84-inches and pressures to 300 lbs. Manual and automatic control.

Consult with your local R-S distributor or write for Catalog No. 10-B and the particular information you need.

The vane closes naturally against the body of the valve and at the correct angle for wedge-tight shut-off. Machined to exceptionally close tolerances. Extended shaft (illustrated) used in inaccessible operating locations. Meehanite and substitute metals available.

R-S PRODUCTS CORPORATION
4535 Germantown Avenue, Philadelphia, Pa.

MANUFACTURERS' NEWS

Announcement is made of the removal of the New York offiffice of the Simplex Oil Heating Corp. to 191 Central Ave., Newark, N. J.

Welding's vital role in the battle of production is covered in picture form in the first issue of Sparks, a new quarterly house organ of Tube Turns, Inc., Louisville, Ky. Laboratory and plant steps that can be done with welding are pictured, and a consensus of manufacturer's opinions is given.

Announcement is made of the founding of the firm Binger-O'Connor-Orrok at 101 Park Ave., New York City. The partners of the firm include Walter D. Binger, Civil Engineer; Robert Barnard O'Connor, Architect; Geo. A. Orrok, Civil, Mechanical and Power Engineer; Harvey Stevenson, Architect, and David Moffat Myers, Mechanical and Power Engineer. The consultant for the firm will be Benjamin Wistar Morris, Architect.

Peerless Acquires Sterling Pump

PEERLESS Pump Division of Food Machinery Corp., Los Angeles, and Canton, Ohio, has acquired Sterling Pump Corp., Hamilton, Ohio, and Stockton, Cal. The plants at Hamilton and Canton will be consolidated at Canton. The Stockton plant will be merged with the John Bean Mfg. Co., a division of Food Machinery.

Consolidation of the two organizations will enable greater production of pumps on order, according to Vernon Edler, vice-president and general manager.

Personnel changes under the new arrangement is as follows:

H. J. McKenzie, president of Sterling Pump Corp., joins the Peerless Pump Division as assistant to Mr. Edler; Fred Jones, manager of Sterling's New York office, will continue with Peerless; John Mikesell, formerly engineer for Sterling, will assume the position of manager of Sterling and small products line; Jack Wade, Sterling's chief engineer, will be in charge of the new developments at the Canton plant; Peerless personnel remains unchanged; Claude Cook, B. J. Craig and

"My boss wasn't kidding when he said he didn't have time to teach me. Yet, with the plant going night and day, I'm being called on more and more to use my own judgment in handling maintenance. That's big responsibility for new men—with piping so important. But I'm catching on—with the help of these Crane Piping Pointer Bulletins."

TODAY, Crane Shop Bulletins are doing a timely twofold job in many plants. (1) Their many practical hints on better piping practice aid in training and supervising maintenance crews. (2) They help step-up the operating efficiency of pipe lines, and assure maximum service from present equipment.

Piping Pointer Bulletins are offered *free* to your plant—for your employee training school, for posting in shops, for distribution to your men. Just ask your Crane Representative; he will be glad to supply them.

VALVES GET CRIPPLED THIS WAY!
PIPE DOPE IS GOOD—BUT NOT ALWAYS!
TIPS ON VALVE TRIM
TO HELP KEEP PIPING ON THE JOB
CHOOSING VALVES FOR BETTER PIPING SERVICE
BETTER SERVICE FROM PIPING EQUIPMENT
GOOD!
BAD!
OPEN—BUT NOT ENOUGH!

CRANE

CRANE CO., GENERAL OFFICES:
836 SOUTH MICHIGAN AVENUE, CHICAGO

VALVES • FITTINGS • PIPE
PLUMBING • HEATING • PUMPS

NATION-WIDE SERVICE THROUGH BRANCHES AND WHOLESALERS IN ALL MARKETS

Ed Pierce will continue as Eastern Division Manager, Eastern Works Manager, and Eastern Sales Manager, respectively.

Mr. Edler also remarked that under the present war emergency, Peerless is carrying a greater backlog of orders than any commercial backlog in the company's history.

Cooper-Bessemer Erects New Plant

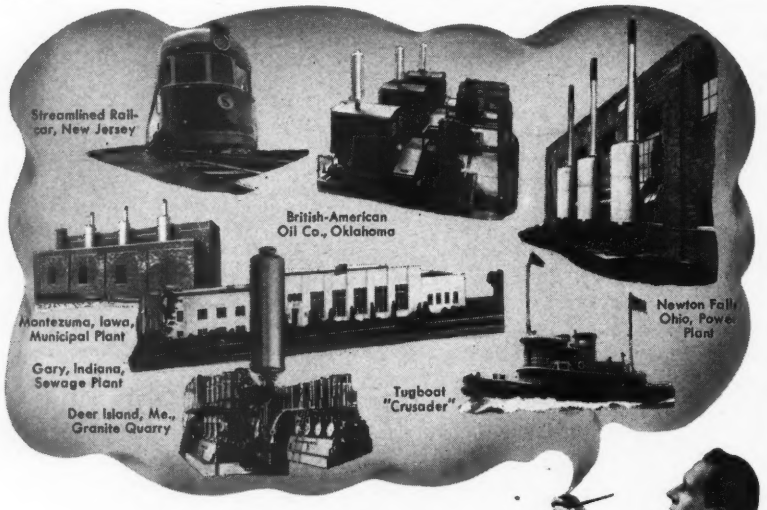
NEW buildings and equipment, which will practically double its productive capacity of Diesel engines, are being erected by The Cooper-Bessemer Corp. at its Grove City, Pa., plant.

Announcement of the new expansion was made by B. B. Williams, Cooper-Bessemer president and board chairman. The project is financed under a plant facilities contract authorized by the Bureau of Ships, Navy Department.

Principal element involved in the present project is construction of two new buildings for increased Diesel engine production.

One of the buildings containing four bays, two of which are 30 by 180 ft.. one 40 by 280 ft., the other 40 by 140 ft., will be integral with the main manufacturing portion of the present plant, and used for storage of materials and for shipping.

The other structure will adjoin the present pattern storage building and will double the plant's pattern storing facilities.


Streamlined Railcar, New Jersey
British-American Oil Co., Oklahoma
Montezuma, Iowa, Municipal Plant
Gary, Indiana, Sewage Plant
Deer Island, Me., Granite Quarry
Tugboat "Crusader"
Newton Falls, Ohio, Power Plant

Diesel Engines with Quiet Exhausts

are NO PIPE DREAM

Once upon a time Diesel engines meant Diesel exhaust noise, and exhaust noise complaints were common from persons living or working near these Diesel plants.

All this is now a thing of the past. Diesel engine owners are operating their engines, today, in residential districts, office buildings, and hotels. By equipping their engines with Burgess Exhaust Snubbers, they have done away with exhaust noise and all exhaust noise complaints.

The plants, shown above,

Sectional view of Burgess STC Series Exhaust Snubber.

are just a few of the many Burgess Snubber installations where Diesel engines are running without creating an exhaust noise nuisance. Burgess Snubbers—operating on the patented snubbing principle—have helped to popularize the use of Diesel engines in every kind of service. Any Diesel engine, anywhere, can be run without objectionable exhaust noise if it is equipped with a Burgess Exhaust Snubber. Burgess Battery Company, Acoustic Division, 2823-K West Roscoe St., Chicago, Ill.

Originators of the Patented Snubbing Principle for Quieting Diesel Exhausts

BURGESS DIESEL EXHAUST SNUBBERS

MANUFACTURERS' PERSONALS

At a meeting of the board of directors of the Carborundum Co., Dr. Frank J. Tone resigned as president and was named chairman of the board. His successor as president is Arthur A. Batts, long associated with the company, and secretary since 1927. Charles Knupfer was named senior vice-president and will continue to direct the sales policies of the organization, and Henry P. Kirchner was named executive vice-president. Edward R. Newcomb and F. Jerome Tone, Jr., were also named vice-presidents and the latter to the board of directors. T. B. Foot was elected treasurer in place of Frank H. Manley, Sr., who resigned and Frank A. Vockrodt was chosen secretary. Assistant treasurers will be A. J. D'Arcangelo, and Gilbert J. Stewart.

Max W. Babb, chairman of the board, Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced the retirement of W. B. Buchanan as president. Mr. Buchanan who has recently undergone a series of operations will continue as a member of the board of directors and on the executive committee. Walter Geist has been advanced from vice-president to executive vice-president, and will handle the duties formerly handled by Mr. Buchanan.

Promotion of Donald C. Luce as general manager, and Watson F. Tait as assistant general manager of the company's electric department, was announced by Jacob T. Barron, vice-president in charge of electric operations, Public Service Electric and Gas Co., Newark, N. J. Both men are graduates of Lehigh University. William R. La Motte has been named general superintendent of electric generation, succeeding Mr. Tait, and will have as his assistant Arthur R. Nelson who has been with the company since 1920.

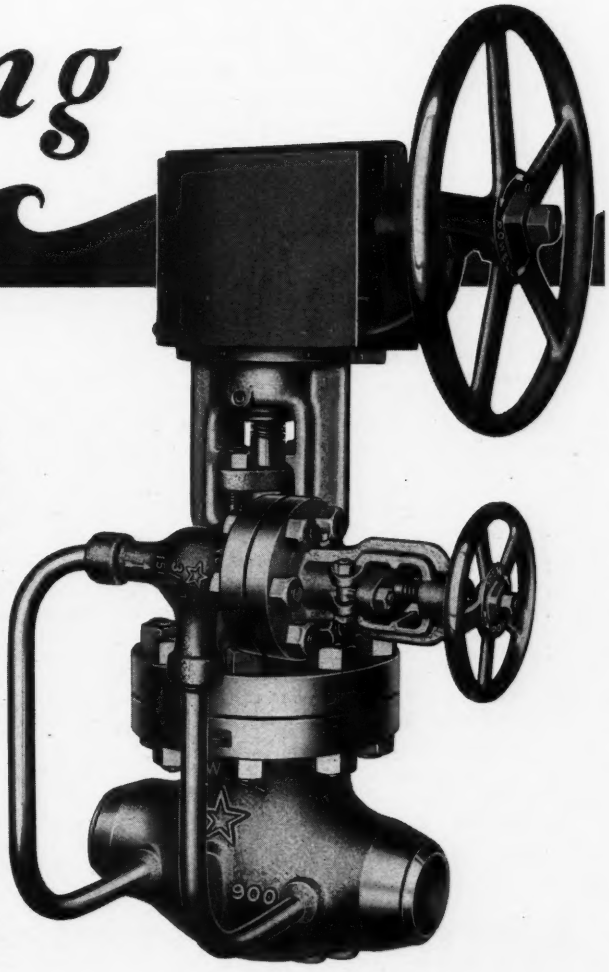
Jas. P. Marsh Corp., Chicago, have announced the promotion of A. D. Rose, sales manager, to assistant general manager. He is succeeded by James Emmett, Jr., as sales manager.

W. A. Shoudy has withdrawn from Orrok, Myers & Shoudy, Associates, to become engineer in charge, Utilities Division, Chemical Construction Corp., 30 Rockefeller Plaza.

George A. Orrok and David Moffat Myers will continue the practice in consulting engineering under the firm name, Orrok & Myers, Associates, at the same location, 21 E. 40th St. New York.

The appointment of Robert Wagner as Northeastern District manager was announced by Frank C. Reed, president of the Westinghouse Elec. Elev. Co. Mr. Wagner was born in Auburn, Indiana, and attended the local schools in Seattle, Washington. He majored in electrical engineering at the University of Washington. In June 1929, he started with Westinghouse Elec. Elev. Co. in Chicago, where he took the

Keep 'em Flowing



The steady, irresistible flow of American War Production is what makes it invincible. The flow of the liquids and gases that play such an important part in all modern production, to be effective, must be perfectly controlled. To keep them flowing under perfect control is our job. We have been at it just four years short of a century. During that time we have met and overcome many a problem concerned with the controlled flow of the fluids of industry.

The Powell line is a collection of valves which have been built to order, each to do a special job. The Powell engineering staff, in the solution of new problems, year after year, have built up the Powell line valve by valve. Today it covers the full range of industry's needs. Tomorrow it will do the same. For industry's problems are our problems and we are ready and able to work them out. When you think of the liquids and gases of industry, and how to control them, think of Powell.

The Wm. Powell Company
Cincinnati, Ohio

Another Powell contribution to the modern power plant . . . a 4", Class 900 pound Cast Steel Globe Valve, with welding ends and special design welded by-pass. Bevel gears, large handwheel, anti-friction bearing yoke assure quick, easy operation. This is but one of a complete line of high-pressure valves specially designed and built by Powell to meet today's demands of the nation's power plants for positive, dependable flow control.

POWELL VALVES

SPEED YOUR SELECTION of proper size and type of steam trap by referring to the book "How To Choose A Steam Trap." If your copy of this helpful book is missing, write for another —it's free.

SPEED INSTALLATION by using Anderson inverted bucket steam traps. No extra fittings to cut, thread and fit —saves as much as 60 minutes installation time per trap—Super-Silvertop is connected with only two threaded joints and either straight-in-line or as an elbow. See illustration above.

MORE PRODUCTION per day on process work with Super-Silvertop because air and condensate are removed from the system quickly—and constantly. This removal is mechanical, not dependent on temperature of the entrained air or moisture. This removal insures system is always full of hot, dry steam—that's why you get more production, more batches per day.

LESS MAINTENANCE time is needed with Super-Silvertop traps. They have long-life valve and seat—large, smooth, drilled passages (not cored) that seldom clog with dirt and scale—guided bucket for positive valve closing. No thermostatic elements to replace.

Send for your free copy of "How To Choose A Steam Trap"— start with this first step toward more speed and more production in meeting today's urgent demands.

THE V. D. ANDERSON COMPANY
1939 West 96th Street • Cleveland, Ohio

Super-Silvertop
STEAM TRAPS

BETTER SERVICE — SAFETY — SATISFACTION
FOR REPLACEMENTS ORDER

CLEAR
REFLEX
COVER GASKET
PRESSURE GASKET
Mica Shields Protectors

PRECISION GAGE GLASSES and GAGE GLASS GASKETS THAT WILL NOT BLOW OUT

Standard Square Cut Gaskets High Pressure Non-hardening and Non-softening

GASKETS THAT WILL FIT EXACTLY

Red Lip-mold Pattern Expansion Type Gasket

Send for Glass and Gasket Chart

Shipment made by parcel post the same day as order is received

Standard and Extra Strong Glasses
MAGNIFYING

Send for Catalog E45

Wire Glass Guards

ERNST WATER COLUMN & GAGE CO.
RUBBER & GLASS DIVISION LIVINGSTON, NEW JERSEY

student course. Later he was transferred to the sales department doing negotiating and estimating work. From 1932 to 1939, he was a sales engineer in the San Francisco District Office. His transfer to the New York Office followed, and he has been there until the present time.

Appointment of Gerald Z. Wollam as works manager of the new war production plant of the Westinghouse Elec. & Mfg. Co. in Sunbury, Pa., was recently announced by Walter C. Evans, general manager of the company's Radio, X-Ray and Broadcasting Divisions.

Mr. Wollam, formerly assistant manager of the Radio Division, will supervise the conversion of the idle Sunbury plant to manufacture bulkier types of communication equipment for the Government.

Don Allshouse, advertising manager, Northern Equipment Co., Erie, Pa., has been granted a leave of absence to enter the U. S. Army as a 1st. Lieut. in the Air Corps. He reported for preliminary training at Miami Beach, Fla, May 28.

Harry R. Meyer has been appointed sales manager of a new maintenance sales department, which will coordinate sales of renewal parts and repairs at Westinghouse Elec. & Mfg. Co. The job will be to keep 7,000,000 motors and generators running in war industries and power houses.

H. G. Madsen has been appointed manager of Technical Employment and Training for the Westinghouse Elec. & Mfg. Co., succeeding Major J. H. Belknap now in the Army Air Service. Mr. Madsen is a graduate of Pennsylvania State College and has been employed at Westinghouse since 1936.

Andrew H. Phelps who has been associated with Westinghouse Elec. & Mfg. Co. since 1937 as manager of purchases and traffic, has been named vice-president. A graduate of Georgia Southern Military College, he studied accounting and law at Brooklyn Institute. He also served as business manager of the Brooklyn Y. M. C. A., and at one time was field manager of the United States Chamber of Commerce. In 1919 he was executive secretary of the International Trade Conference at Washington.

Appointment of Gail E. Spain as vice-president, and the appointment of John Q. McDonald to general sales manager, is announced by Caterpillar Tractor Co.

Mr. Spain, who has been general sales manager since November, 1940, succeeds the late D. G. Sherwin, and will make his headquarters in San Leandro, Cal., to co-ordinate activities there with operations in Peoria.

J. D. Fletcher, vice-president, will take over the active direction of export sales in addition to his duties as head of the export department.

Besides elevating Mr. Spain to a vice-presidency the board elected C. O. G. Miller, San Francisco, Cal., a director in the position of the late John A. McGregor.

why 10 REASONS you can bank on FAIRBANKS

MAKE SURE YOUR VALVES CAN'T BE REPAIRED BEFORE SCRAPPING THEM

To help conserve America's precious metals—to avoid production "holdups" from valve failure and cut valve maintenance costs to the bone—standardize on Fairbanks longer-lasting valves.

No part of Fairbanks Valves is too small to receive the same careful and exacting attention as the largest and most important part. Nothing is spared in the cost of materials and labor to make every part as perfect as possible.

We confidently believe that a careful comparison will convince you that no other valve will give more dependable performance, lower upkeep cost or greater endurance than Fairbanks, and they sell at standard prices.

The best way to make sure that Fairbanks Valves are all we claim is to ask the Fairbanks Distributor in your territory to let you examine them. If you don't know his name we'll gladly tell you and send a copy of our catalog No. 21 on request.

1 Prompt service through conveniently located distributors.
2 Standard and Renewable types for practically every need.
3 Quality in design, materials and workmanship.
4 Uninterrupted service.
5 Low in maintenance cost.
6 Maximum years of service assured.
7 Acclaimed for dependable performance.
8 Nationally accepted by users.
9 Backed by over 50 years' specialized experience.
10 Technical assistance in valve selection.

THE FAIRBANKS COMPANY
399 Lafayette St., New York, N. Y.
Boston, Mass., Pittsburgh, Pa.

You can bank on...

FAIRBANKS

as the **RIGHT VALVES TO USE**

(Above) **Roto Model 105 motor with chain joint and drill head for superheater tubes.**

(Right) **Roto Model 125 motor with long 4-arm head for curved tubes.**

ROTO

Does a Quick, Clean Job in any Cleanable Tube

Roto offers a complete line of tube cleaners to meet practically every power plant requirement, effectively and economically. Air, steam and water-driven models are available for cleaning straight or curved tubes and pipes in boilers, superheaters, transfer lines, economizers and condensers, from ½" I. D. up. We have a wide range of cutter heads, scrapers and brushes to remove hard scale and soft, gummy deposits. Share our 32 years' experience as tube cleaner specialists by letting us serve you.

SEE OUR ADV. IN SWEET'S

The ROTO Company

145 SUSSEX AVENUE, NEWARK, N. J.

Wanna Buy a Duct?

When next you are in the market for an air duct or chimney, boiler or drive belt, water pump or steam purifier—consult the "Where To Buy" Directory of POWER PLANT ENGINEERING. It's the quick and easy answer to your questions of who makes what in the power industry.

Westinghouse Elects Four New Vice-Presidents

L. E. Osborne

ELECTION of four vice-presidents was recently announced by G.H. Bucher, president of the Westinghouse Elec. & Mfg. Co.

They are Andrew H. Phelps of Pittsburgh, Pa., manager of purchases and traffic; L. E. Osborne of Philadelphia, Pa., manager of the steam division; Frank C. Reed, of Jersey City, N. J., president of the Westinghouse Elec. Elev. Co., a subsidiary; and Walter C. Evans of Baltimore, Md., general manager of radio X-ray and broadcasting divisions. All the new vice-presidents will continue in their present executive posts.

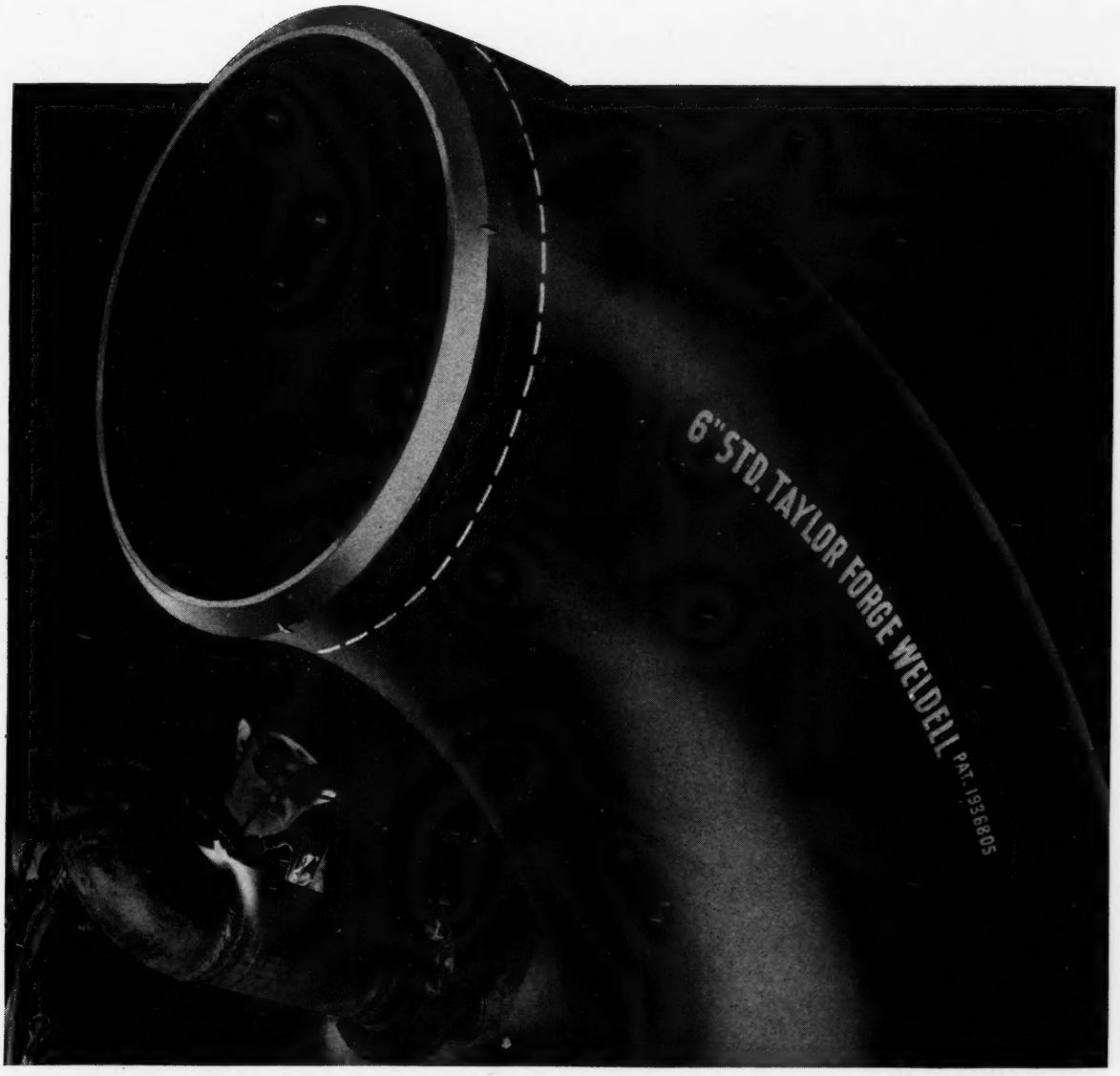
L. E. Osborne, manager of the Westinghouse steam division with headquarters in the South Philadelphia works, was born near Verona, Pa. He went to work for Westinghouse as a tool clerk in 1910. In 1915, he was given the task of training new men as tool makers. After various promotions, he was appointed superintendent of the metal stamping department in 1930. He later became works manager of the meter division works in Newark, N. J. In 1934, Mr. Osborne was made works manager of the East Springfield, Mass., works, and in 1939 manager of manufacturing and engineering for the merchandising division, with headquarters at Mansfield, Ohio. In 1941, Mr. Osborne spent several months as chief of the heavy ordnance section in the Ordnance Branch of the Production Division of OPM in Washington. He became manager of the steam division in November, 1941.

E. W. Jackson and D. O. Nash Promoted

APPOINTMENT of E. W. Jackson to the position of assistant to the president and the promotion of D. O. Nash to general service manager, is announced by L. B. Neumiller, president of Caterpillar Tractor Co., Peoria, Illinois.

Mr. Jackson has been general service manager of Caterpillar since 1937. A native of Aikin, Maryland and a graduate of Johns Hopkins University at Baltimore, after finishing college he served as junior engineer for the United States War Department, becoming Proof Director of the Ordnance Department at the Aberdeen Proving Ground. In 1929 he took a position in the Caterpillar research laboratory at San Leandro, Calif. When the laboratory was transferred to Peoria in 1933, Mr. Jackson entered the Service Department.

Mr. Nash, new general service manager, is an alumnus of Oregon State University. After 7 yr. in the service department of the Cousins Tractor Co., he joined Caterpillar Tractor Co. at San Leandro in 1937. He served 2 yr. as field service representative, before taking a position as service and parts manager at Hayward, Calif. and in



TANGENTS rank high in the list of extra values

THOSE straight segments on each end of every WeldELL accomplish three important things: They make lining up easier; keep the weld out of the zone of greatest stress; facilitate the use of slip-on flanges.

This feature, which of course entails extra manufacturing operations, is just one of many examples of the extra-value you get in WeldELLS and other Taylor Forge Fittings for pipe welding.

A number of other extra-value features are listed opposite. Notice that each contributes something to the ease and economy of installation or to the soundness of the finished job.

These features are combined only in WeldELLS. Lacking any one of them WeldELLS could not be *"the fittings that have everything"*.

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New York Office: 50 Church Street • Philadelphia Office: Broad Street Station Bldg.

WeldELLS
have everything—

No other fittings for pipe welding combine these eight features. In addition to tangents these features are:

1. **Seamless**—Greater strength and uniformity.
2. **Precision quarter-marked ends**—simplify layout and help insure accuracy.
3. **Selective reinforcement**—provides uniform strength.
4. **Permanent and complete identification marking**—saves time and eliminates errors in shop and field.
5. **Wall thickness never less than specification minimum**—assures full strength and long life.
6. **Machine tool beveled ends**—provide best welding surface and accurate bevel and land.
7. **The most complete line of Welding Fittings and Forged Steel Flanges in the World**—insures complete service and undivided responsibility.

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TURBINE
DESIGN··

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POWER FACILITIES FOR *Now*
AND FOR THE *Future* . . .

● Those who have Murray Equipment now will be in a more secure position as far as power requirements are concerned, for the future.

For example, the Type "U" Turbine illustrated above is adaptable to widely varying operating conditions—is an ideal drive for generators, pumps, fans, blowers, and miscellaneous machinery. All construction features are carefully coordinated for either direct drive through flexible couplings, or combination Murray reduction gear drives.

Bulletin T-118 is valuable now to those who have high priorities—those who are not in this purchase group will find it advisable to have this bulletin on hand so that future turbine needs can be planned.

Bulletins also available on MURRAY BOILERS and ENGINES.

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1940 he joined the field service division. He has also served as manager of the service development division and manager of the service engineering division.

G-E Promotions

IRA A. TERRY has been appointed general assistant to H. A. Winne, G-E vice-president in charge of design engineering, Apparatus Department, it has been announced by the company. Walter C. Heckman of the G-E Turbine Engineering Department has succeeded Mr. Terry in the Works Manager's Office.

Mr. Terry, born in Ogden, Utah, graduated from the University of Utah in 1925 with a B.S. in electrical engineering. He entered the employ of General Electric as a student engineer on the "test" course, and studied at Union College. In 1929 he received the degree of M.S. in electrical engineering, completing General Electric's 3-yr. advanced course in engineering in 1930. Mr. Terry is a member of the A.I.E.E.

Mr Heckman, a native of Pekin, Ill., was graduated from the University of Illinois in 1920 with a B.S. degree in electrical engineering, an M.E. degree in 1926. In 1920 he became a student engineer in General Electric's "test" course, subsequently being transferred to the Turbine Engineering Department. In 1931 he was appointed engineer of the Rotor and Diaphragm section of that department, the position he held until his recent promotion.

Mr. Heckman has been the recipient of two Charles A. Coffin Foundation awards, one in 1934 and the other in 1941, both for improvements in turbine design. He is a member of the New York State Society of Professional Engineers.

E. J. Schwanhausser Worthington Director

EDWIN J. SCHWANHAUSSER, vice-president, Worthington Pump & Machinery Corp., has been elected to the corporation's board of directors, filling a vacancy created by the death of Edward T. Fishwick.

A vice-president of the corporation since 1939, and a member of the Worthington organization since his graduation from Stevens Institute of Technology in 1915, he was connected with the Harrison, N. J., Works for 14 yr., being appointed Assistant Manager in 1927. In 1929 he was appointed manager of the corporation's Buffalo Works, made vice-president in 1939, directing the corporation's sales of Diesel and gas engines.

Republic Steel Corp. Promotions

THE PROMOTION of E. M. Kropp and Peter Robertson to assistant chief industrial engineers has been announced by C. M. White, vice-president in charge of operations, Republic Steel Corp.

Mr. Kropp, born in Sharon, Pa., graduated from Geneva College, Beaver Falls, Pa., in 1929. He was in the Industrial Engineering Department of Jones & Laughlin Steel Corp. for 2 yr. and in 1931 joined Republic's Industrial Engineering Department at Youngstown and was later transferred to Cleveland. Mr. Kropp will handle management studies and general industrial engineering problems.

USE THIS READING-PRATT & CADY VALVE

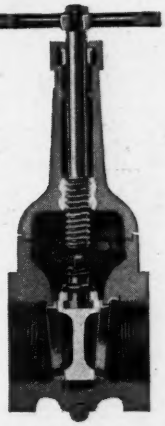
AS PART OF YOUR PROGRAM TO SWING TO ALTERNATIVE MATERIALS FOR THE DURATION

Wherever you need Clip Gate Valves of any size—*even smaller sizes*—turn your thoughts away from bronze bodies. The increasing war tempo has placed the supply of brass and bronze in an even more critical position.

You will be much more likely to get delivery if you use, as an alternative, valves with bodies of P&C High Test Iron.

If bronze trim is imperative, the spindle will be of P&C High Tensile Rolled Bronze. The Follower, cast-in bonnet bushing, renewable seat rings and reversible I-beam wedge will be P&C Special Valve Bronze. That sounds like a great deal of critical material. Actually, it represents scarcely ¼ of the total weight of the valve.

Bear in mind, of course, that, even where it is possible to obtain release of materials for you, deliveries are subject to the fact that in this plant the needs of America's Army and Navy—and those working directly on war production, have first call. We are doing everything within our power as manufacturers of valves and fittings to speed the day when Victory brings Peace.



P&C Figure 122-C
Iron Body Clip Gate Valve

Bronze mounted and all iron. Working pressures; 150 lbs. of steam; 225 lbs. OWG. Sizes; ¼" to 3".

Note the round bonnet which permits use of male and female bonnet joint with asbestos gasket and which assures tightness. Full U-Bolt equalizes pressure on both sides. Body guide lugs and closed bonnet eye-lugs prevent slippage. Heavy I-beam wedge. Full size body guides for wedge. P&C assembly of spindle and wedge provides great strength.

Bonnet bushing is cast in.

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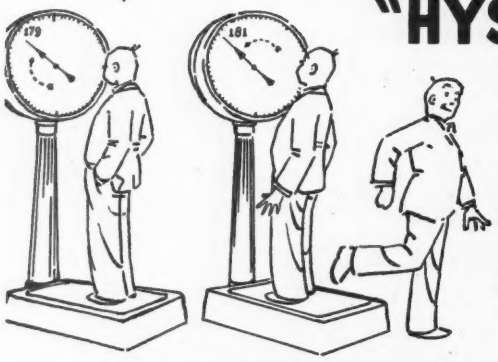
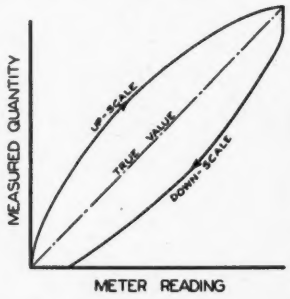
The Greeks had a word for it--

"HYSTERESIS"



Let's say you actually weigh 180 pounds. When you step on the platform spring scales in the drug store, the pointer goes up fast until it approaches 180. The movement becomes slower and slower. The pointer finally stops at 179. Now you try it again but this time another man stands on the scale with you, then steps off. The pointer comes down from 300 and gives your weight as 181. The discrepancy results from approaching the balance point from opposite directions with a deflectional system. Exact balance is never attained. "Hysteresis" is the word for it and the curve for it is shown below.



Null Method Eliminates Hysteresis

The null, or zero balance method (in contrast to a deflectional system) balances the unknown quantity by adjusting a known quantity of the same kind. A highly sensitive detector is used to determine the point of balance. The float of the friction-free transmitter serves as a pilot for an external motor drive which restores the electrical bridge to balance. This powerful motor operates the pen, indicator, and integrator with high and equal power throughout the entire scale.

NOTE: A bridge circuit alone is not a null method meter. A galvanometer is required to detect unbalance and an external source of power is needed to restore balance. These are found only in the Cochrane Electric Flow Meter.

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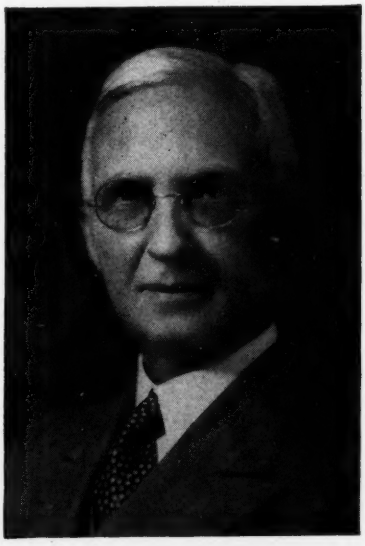
(1) Speed governmental accomplishment in the drive for victory . . . (2) Expedite conversion of industry to wartime production . . . (3) Ease the shock of war on civilian population and national economy . . . (4) Divert demand from scarce articles to those more plentiful . . . (5) Explain business to the public . . . (6) Condition markets for postwar developments.—G. D. Crain, Jr., Publisher of "Industrial Marketing"

Mr. Robertson was born at Springburn, Glasgow, Scotland. He came to the United States in 1924 and took a toolmaking apprentice course at the General Electric Co. in Schenectady, followed by a 1-yr. special business course. He then served as foreman in the gear room and worked 4 yr. on cutting gears for gun controls and searchlights. In 1932 he was transferred to the industrial engineering department, and the following year joined Republic's Berger Mfg. Div., Canton. In 1937 he was transferred to Truscon Steel Co., Youngstown, and 2 yr. later to industrial engineering work in the general office at Cleveland. He will continue on manufacturing problems and plant layouts.

C. N. Barney, Worthington Vice-President

THE BOARD of directors of Worthington Pump & Mach. Corp. has elected Charles Neal Barney of New York a vice-president of the corporation. A member of the Worthington organization



C. N. Barney

since 1918, treasurer since 1931 and head of the corporation's legal department, Mr. Barney practiced law in Massachusetts and lectured at Northeastern Law School and Boston University Law School.

He is a member of he American, Massachusetts and New York Bar Associations, author of the law text "Equity and Its Remedies" and was, early in his career, Mayor of Lynn, Mass.

F. P. C. Announces Appointments

FEDERAL POWER COMMISSION has announced the resignation of Thomas R. Tate as director of its National Defense Power Staff and chief of its Bureau of Electrical Engineering. The Commission also announced the appointment of John C. Beebe as Regional Administrator of its San Francisco regional office. Mr. Beebe was formerly chief of the Commission's Bureau of Water Power.

The Commission has designated George H. Buck as Acting Director of

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SILENT CHAINS ROLLER CHAINS FLEXIBLE COUPLINGS CLUTCHES

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and other booklets on water treatment for Power Plants, Refrigeration Plants, Petroleum Industries, Process Industries, Public Buildings, and Transportation Industries.

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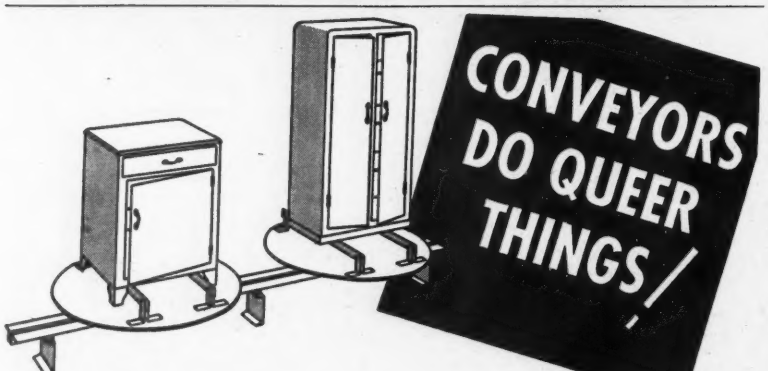

Probably few see Conveyors do the queer things Gifford-Wood jobs are designed to do—like carrying loaded shells and providing safety features if one should explode. Or carrying big cabinets on individual turntables, or thimble-sized parts on a spike, or toy tanks to be sprayed, or hush-hush equipment for bombers. Of course bulk material, machine parts, and packages are regular business for Gifford-Wood tailored-to-order elevating and conveying systems.

The engineering approach to the problem, the absence of urge to "sell" any system except the most suitable for the job, the undivided responsibility for design, construction and installation, the ingenious mating of standard with special design for economy, the 128-year background of experience—all these fit Gifford-Wood to speed production for all-out requirements in busy defense plants.

Book 200-PE has 124 pages of good ideas for all who have elevating and conveying problems on their minds. A request on your business stationery will bring a copy promptly.

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its National Defense Power Staff and Acting Chief of its Bureau of Electrical Engineering; and has designated Frank L. Weaver as Acting Chief of its Bureau of Water Power during Mr. Beebe's absence.

Mr. Tate has resigned to resume the practice of consulting engineering and will become the Washington representative of a Boston engineering and construction firm. He became associated with the Federal Power Commission in 1933 as Director of the National Power Survey and was subsequently made Chief of the Commission's Power Resources and Requirements Division. Mr. Tate was appointed Director of the National Defense Power Staff which was created pursuant to the President's directive to the Commission dated June 14, 1940, and was later made Chief of the Bureau of Electrical Engineering.

A. J. Moses, C. E. Vice-President

THE ELECTION of A. J. Moses as a vice-president of Combustion Engineering Co., Inc., was announced by J. V. Santry, president of the company.

Mr. Moses, a graduate of Georgia School of Technology, has been connected with Combustion Engineering Co., or its constituent companies, since 1920 and for several years past has been general manager of the company's Hedges-Walsh-Weidner Division at Chattanooga. He is a member of the A.S.M.E., A.S.T.M., American Welding Society and the Chattanooga Engineers Club.

NEWS FROM THE FIELD

Dr. A. C. Fieldner, head of the Technological Branch, Bureau of Mines, United States Department of the Interior, has been awarded the Melchett Medal, by the Institute of Fuel, London. The honor has only been given to one other American.

J. R. Michel, efficiency engineer for Commonwealth Edison Co., has been elected chairman of the Chicago section of the American Society of Mechanical Engineers. He was vice-chairman of the group during the past year.

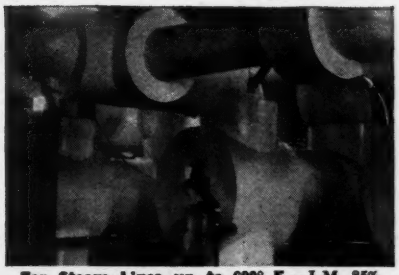
A graduate in mechanical engineering from Purdue University, Mr. Michel has been with Commonwealth Edison Co. since 1923. He served as assistant boiler room engineer, boiler room engineer and assistant chief engineer before being promoted to his present position.

The Associated Gas & Electric System has arrived at the agreement stage for disposal of the Kentucky-Tennessee Light & Power Co., its largest southern plant. The base price is said to be $7,000,000.

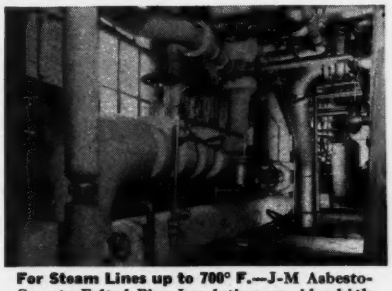
The transaction is an involved one, due to agreements with some municipalities, the T. V. A., R. E. A., private purchasers and also another utility company. One obstacle to the sale has been cleared by an agreement between five municipalities located in Kentucky and a subsidiary company, Associated Electric Co. amounting to $3,500,000.

For lasting efficiency and maximum fuel savings

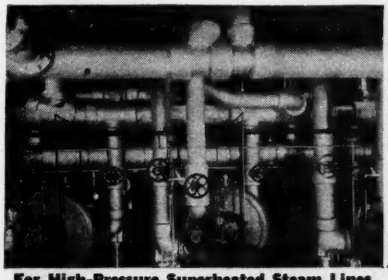
Johns-Manville Insulations



For Steam Lines up to 600° F.—J-M 85% Magnesia Pipe Insulation. Furnished in 3-ft. sections or segments in the following thicknesses: Standard, 1½", 2", 2½", Double Standard and 3" (double layer).

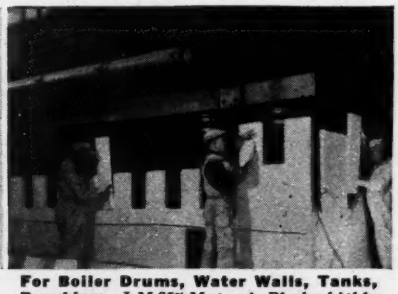


For Steam Lines up to 700° F.—J-M Asbesto-Sponge Felted Pipe Insulation provides high salvage and resistance to abuse. Furnished in 3-ft. sections in thicknesses from 1" to 3", for standard pipe sizes.



For High-Pressure Superheated Steam Lines—Superex Combination Pipe Insulation. Inner layer of Superex High Temperature Insulation with outer layer of J-M 85% Magnesia. Has unusual heat resistance; high efficiency.

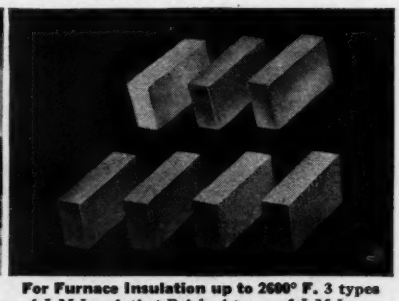
For Cold Water Lines—J-M Anti-Sweat Pipe Insulation. Designed to prevent condensation. In 3-ft. sections; thicknesses, ½" and ¾", solid construction; 1", 1½" and 2", broken joint construction.



For Boiler Drums, Water Walls, Tanks, Breechings—J-M 85% Magnesia Blocks, highly efficient at temperatures up to 600° F. Sizes 3" x 18", 6" x 36", 12" x 36", flat or curved. Thicknesses 1" to 4".

For Refrigerated Service—J-M Rock Cork. Basically mineral. Can't rot, won't support vermin or mold. In sheets, 18" x 36", 1" to 4" thicknesses. Pipe covering in 3-ft. sections with integral waterproof jacket.

For Furnace Insulation up to 1900° F.—J-M Superex Blocks, for years the most widely used block insulation at these temperatures. Sizes, 3" x 18", 6" x 36", 12" x 36". Thicknesses, 1" to 4", flat or curved.



For Furnace Insulation up to 2600° F. 3 types of J-M Insulating Brick, 4 types of J-M Insulating Fire Brick, are available. Furnished in all standard 9" shapes of the 2½" and 3" series, as well as in specials.

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For every temperature . . . for every service

PRODUCTION Upped 30%
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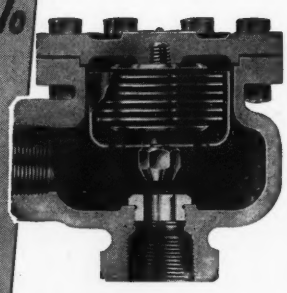

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Frequent intermittent discharge of condensate creates better circulation of steam in water heaters, pipe coils, kettles, driers, unit heaters and other equipment, thus inducing rapid heat transfer. Many reports show the installation of Nicholson Industrial Traps have stepped up production of heated units as much as 30 per cent.

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Nicholson Traps are of the simple thermostatic bellows type, utilize the temperature difference between steam and condensate to open and close their valves. The bellows construction insures quick, automatic action. Nicholson Traps drain completely when cold, prevent bothersome freeze-ups. Also provide a discharge capacity from two to six times that of average traps.

There is a size and type of Nicholson Trap to suit every need. Catalog No. 941 describes them in detail; contains many practical suggestions for keeping water heaters, pipe coils and other equipment operating at top efficiency. Ask for your copy.

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for steady, high speeds and uniform loads.

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withstands extremely heavy, sustained pressures.

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New Bulletin giving full details, specifications on all Magnolia Metals sent free on request.

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MAGNOLIA BEARING METALS

A.S.M.E. Prepares for Cleveland Session

THE SEMI-ANNUAL MEETING, American Society of Mechanical Engineers, to be held at the Hotel Statler, Cleveland, O., June 8-10, will in a large part be devoted to all-out effort planning to help the armed forces.

Visits to plants engaged in war production will, from necessity, have to be foregone, or to a great extent decreased. The nature of the information that will be discussed emphasizes the importance of attendance at as many sessions as possible.

The Fuels Division will have three major sessions. R. B. Engdahl, Battelle Memorial Institute, Columbus, O., will present a paper on pulverized coal for forge furnaces and Lee Wilson of the Lee Wilson Engineering Co., Cleveland, will discuss radiant tube furnaces.

Otto de Lorenzi, Combustion Engineering Co., New York, will deliver a paper on spreader stokers on the Great Lakes.

Participating in a discussion on training war workers will be O. C. Heffner, Hoover Co., Canton, O., and this will take on the form of a round table discussion.

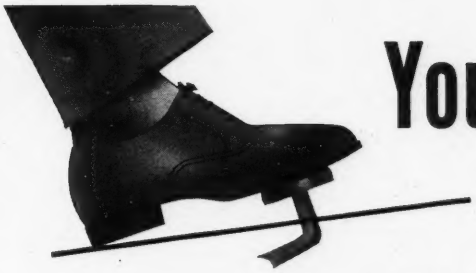
The Power Division will sponsor a joint meeting with the Special Research Committee of the A. S. M. E. at which time critical-pressure steam boilers will be discussed. H. L. Solberg, Purdue University, will be the speaker. Others schedued before this section include F. F. Fisher, Detroit Edison Co., and Hilmer Karlson, and Sven Holm, Air Preheater Corp., Wellsville, N. Y.

Diesel Engineers Wartime Program Meeting

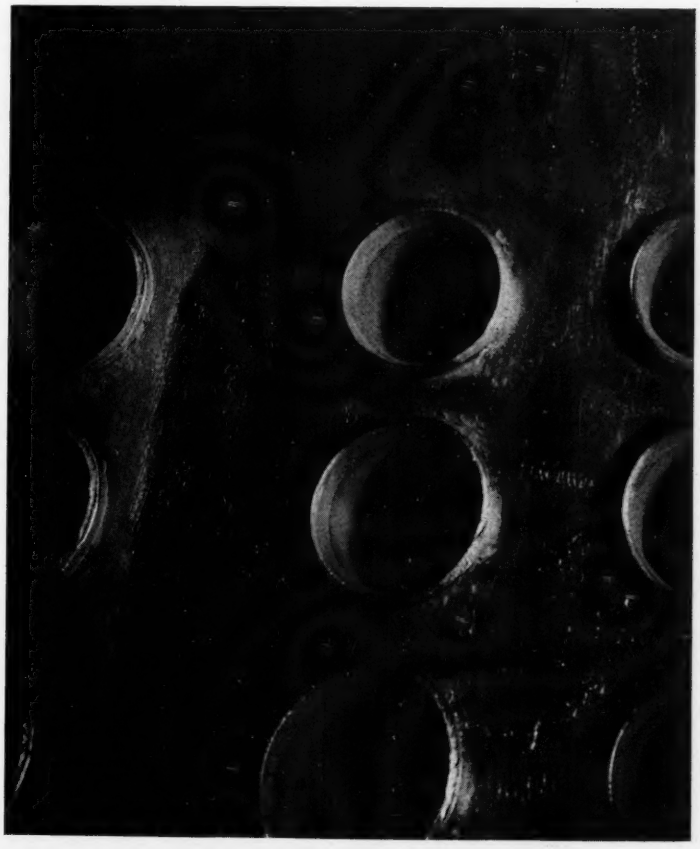
A ROUND-TABLE discussion of wartime operating problems and numerous papers on timely subjects will highlight the 15th National Meeting of the A.S.M.E. Oil and Gas Power Division in Peoria, June 17-19. The S. A. E. Diesel-Engine Activity will co-operate in this meeting, contributing a symposium and several papers.

According to present plans, the round-table session will start with short practical talks by operators of internal-combustion-engine equipment and manufacturer's engineers—J. B. Harshman, Stanolind Pipeline Co.; C. U. Pollard, Algona, Iowa; E. R. Spencer, Cooper-Bessemer Co.; L. Downing, Rock Island Railroad; Lee Schneitter, Ebasco Services; R. T. Sawyer, American Locomotive Co.; A. B. Willi, Federal-Mogul Corp., and others. In the open discussion period following, operators and engineers will pool their ideas and experiences. Users of Diesel and gas-engine equipment are invited to bring questions arising out of the special problems of operation and maintenance under war conditions.

The S. A. E. will present a symposium on Control of Lubricating-Oil Consumption in High-Speed Diesel Engines, with the following speakers: M. M. Roensch, Chrysler Corp.; A. T. Stahl, Mack Mfg. Corp.; M. O. Teetor, Perfect Circle Co.; Stuart Nixon, Sealed Power Co.; W. B. Sawers, American Hammered Piston Ring Div., Koppers Co.; Paul S. Lane, Muskegon Piston Ring Co., F. G. Shoemaker, De-

Re-Line  Your Boiler, Too

AN APEXIOR LINING ON WORN BOILER METAL GIVES INDEFINITE SERVICE



A new lining for your brakes to take the punishment and provide safe efficiency is only common sense.

Today, old, but irreplaceable steam boiler equipment — some of it almost ready to be condemned — is being re-lined with APEXIOR — to make the metal last for years to come.

Any boiler that passes the required hydrostatic test when cleaned, can be kept in operating condition indefinitely with APEXIOR protection.

APEXIOR — the Long-Wearing, Renewable Lining for Tubes and Drums

APEXIOR No. 1 is an easily applied protective coating that seals the bare metal against corrosion and direct wear. The new surface takes it all. Scale cannot form a tight bond with APEXIOR — and is quickly removed with a wire brush.

The APEXIORIZED surface lasts 2-3 years or more. And it is easily renewable, with a hand-brush or power coater, to keep the original metal intact.

APEXIOR guarantees good metal condition . . . no other protection offers the same assurance and security

Long-time users of APEXIOR know it as a supplementary protection along with chemical feedwater treatment, helping them maintain long life and most efficient operation for steam boiler equipment.

Present conditions make it mean far more than this . . . a *necessity* in keeping old and new equipment going for the duration.

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Recommended by all U. S. and Canadian boiler insurance companies.

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PROTECTIVE COATINGS FOR STATIONARY BOILERS, LOCOMOTIVES AND STEAMSHIPS

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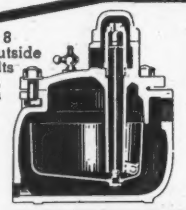
Drainage Equipment for a wide range of Operating Conditions...

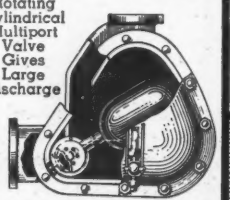


Only 8 parts—outside of bolts and pins

HEAVY DUTY BUCKET TRAP

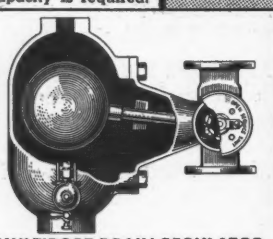
Large cast-iron bucket holds valve tightly to seat until water overflows rim, opening valve wide.

Rotating Cylindrical Multiport Valve Gives Large Discharge



MULTIPORT DRAINER

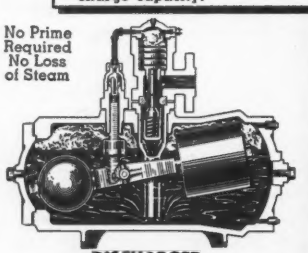
For handling drainage of low-pressure separators or other apparatus where large discharge capacity is required.



MULTIPORT DRAIN REGULATOR

Continuous discharge is maintained by height of condensate in body. Valve shuts off discharge when condensate falls to normal level. Tremendous discharge capacity.

No Prime Required
No Loss of Steam



DISCHARGER

For removing large quantities of condensate under high pressure (150 to 2000 lb./sq. in. or higher) from heaters, purifiers, coils, etc.

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Cochrane Corp., 3123 N. 17th St., Phila., Pa. Please send me copies of your Publications on Condensate Drainage.

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troit Diesel Engine Division, General Motors.

Other technical sessions will cover engine design, power-plant design, and combustion. A trip to the Caterpillar Tractor Co.'s proving grounds will display Diesel-powered tractors and earth-moving equipment in action.

More than 30 leading manufacturers will display the latest in engine and accessory equipment in the largest exhibit yet held in connection with this conference. Considerable interest attaches to the Scientific Exhibit, a new feature, which will include displays from universities and research organizations, and a captured Mercedes-Benz aircraft engine. R. W. Young, Chief Eng., Wright Aeronautical Corp., will analyze the engineering details of this unit.

A.S.T.M. Meetings Planned

More than 100 technical papers and reports are scheduled for presentation at the 45th Annual Meeting of the American Society for Testing Materials, to be held at the Chalfonte-Haddon Hall, Atlantic City, N. J., June 22 to 25.

Eighteen separate official technical sessions are on the program, and more than 150 meetings of technical committees scheduled.

The radiography symposium will amplify and supplement the 1936 symposium, and it is believed that the X-ray inspection and testing of tools will take on additional significance due to the emergency production situation.

Committee E-7 will have charge of this function and includes Lars Thomassen, H. E. Seeman, and J. T. Norton. A round table discussion of Solvent Action will include water for industrial uses. Max Hecht and R. E. Hall are in charge of the section and are arranging for speakers on the subject which will be followed by comments from the floor.

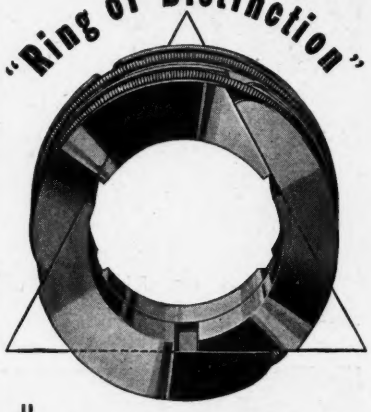
Technical papers of ferrous and non-ferrous metals will include fatigue tests as a means of evaluating corrosion damage, influence of combination of principal stresses on fatigue of metals, creep strength of malleable iron, correlation of mechanical properties with radiographic appearance of magnesium alloys, creep characteristics of some copper alloys at elevated temperatures, comparative quality of converter cast steels, and a new magnetic test method.

Among the miscellany from other fields that will be covered, stress-strain of timber beams, testing of hydrometers, and acid and alkali resistance of plastics are included.

Grand Coulee May Get Shasta Units

Two 75,000-kw. hydro electric generating units being fabricated for installation at Shasta Dam, major unit of the Central Valley development, probably will be diverted to emergency war use at Grand Coulee Dam in the Pacific Northwest at the suggestion of the War Production Board Power Branch. The deal is calculated to make 150,000 kw. of capacity available a year sooner than otherwise possible. The two units can be completed for installation at Coulee some time this fall, more than 6 mo. sooner than any of the second battery of three 108,000-kw. Coulee units can be finished. They cannot be utilized to produce power at Shasta

"Ring of Distinction"



Install FRANCE Metal Packing for "'Round-the-Clock" Production

The renewal of ordinary packing every few weeks or months increases horsepower and production costs.

Minimum friction is encountered with France Metal "Ring of Distinction" Packing. No undue force can be exerted on rods or stems by tightening the stuffing box stud nuts. The rings are free to float in the case that retains them and are held to the rod or stem with a garter spring having minimum tension.

The result is tight "full-floating", trouble-free performance *for years*. Prompt delivery assured.

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44-page Catalog of useful and valuable information. Write for your free copy of Catalog M-5, with facts on

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- **Installation Procedure**
- **Methods of Lubrication**
- **Pressures and Temperatures**
- **Oil Return and Stripping Rings**
- **Handy Reference Tables**

Request France Engineers to analyze your packing requirements. There is a representative close at hand.

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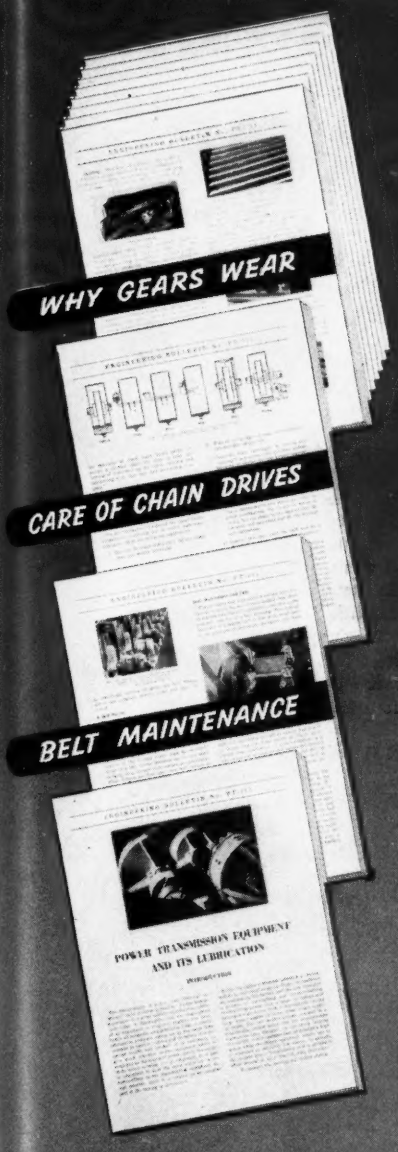
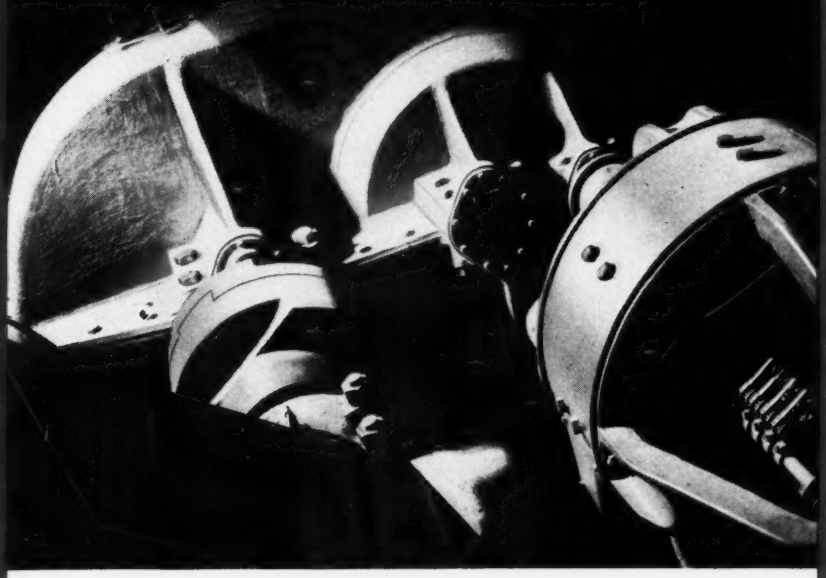
Original **FRANCE METAL PACKING**

TO AVOID FAILURES ON OVERWORKED POWER TRANSMISSION EQUIPMENT



POWER TRANSMISSION EQUIPMENT AND ITS LUBRICATION . . . This Engineering Bulletin is *Free* to operators in the Middle West. It discusses the operating and lubrication problems found on common types of power transmission equipment. It will be particularly helpful to men who have taken over new responsibilities in the maintenance of this type of equipment. Just write Standard Oil Company, Room 1223, 910 South Michigan Avenue, Chicago, Illinois, for Bulletin P. T. 1112.



DOUBLE-CHECK LUBRICANTS AND LUBRICATING METHODS

● EQUIPMENT hard-pressed to meet production demands . . . replacements hard to get . . . maintenance just two jumps ahead of trouble . . . Are these the problems you face today in maintaining your power transmission equipment? Then here's a suggestion that may help you.

Take an inventory of your lubrication. See if you can't avoid the penalty of high maintenance by finding the answer to questions like these—

- **Where have lubricating needs been changed by new demands on your equipment?**
- **Are your present lubricants giving adequate protection *now*?**
- **Would better lubricants be a worthwhile investment at this time to reduce replacements of scarce bearings and parts?**

If you are too busy, in these times, to find the answers, get a Standard Lubrication Engineer's help.

He can offer lubricants that meet the new demands. He is working with other plant men on problems exactly like yours. His recommendations will save time spent experimenting with products and lubricating schedules. But let one of these Engineers himself explain just what he does. Write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you.

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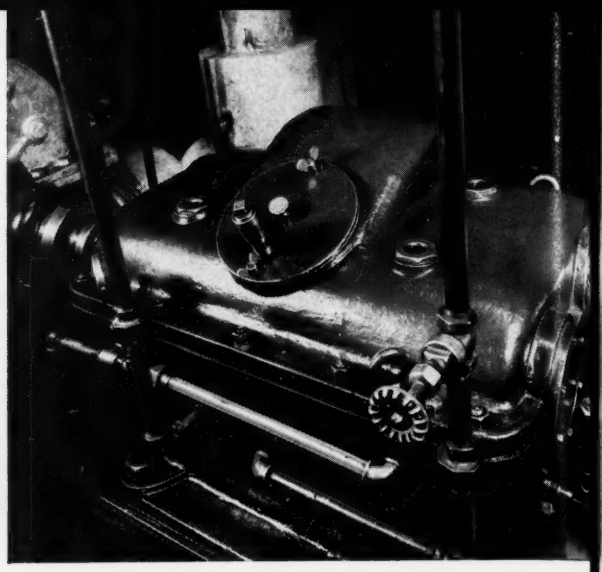
STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION EN

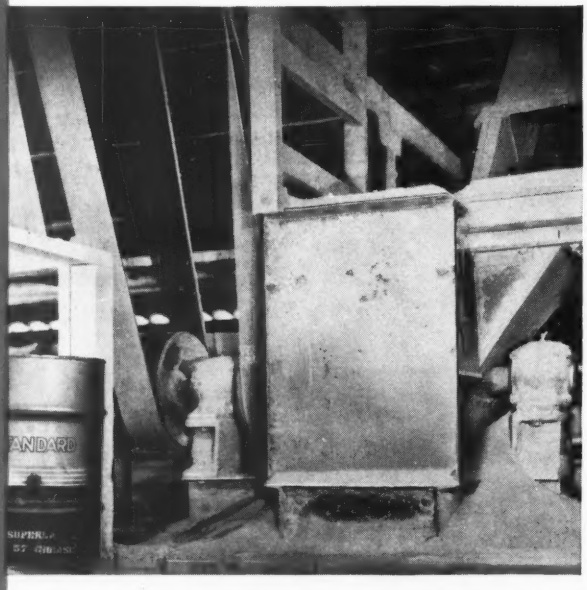
G...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICAT

ONE WAY TO AVOID BEARING REPLACEMENTS NOW... TRY CHANGING LUBRICANTS



● "KEEP OILERS ON THE RUN" was the superintendent's answer to high bearing maintenance costs caused by dusty conditions in a midwest fertilizer plant. It wasn't a happy answer. Crusher, conveyor, and other bearings were greased four times a day with consequent heavy costs for labor and grease.

The only answer seemed to be—redesign the bearings. At least, that's how matters stood when a Standard Lubrication Engineer was handed the problem.



His answer was higher quality grease—Superla. It kept dust out of the bearings, and greasing was needed only once a day. A bearing replacement became a thing of the past. The higher price was easily offset by the savings.

If you have any problem with bearings, see a Standard Oil Engineer before making any costly changes. There's one of them near you and he's ready to help you with your bearing or other machine operating problems.

OIL IS AMMUNITION

USE IT WISELY

CUT SHUTDOWN TIME FOR REDUCTION GEAR CARE WITH STANOIL

A North Dakota power company found it saved both time and money on the reduction gear pictured above. With a conventional oil, sludge formed in the units every three to six months. Then a fill of Stanoil was tried. It ran a full year before it was replaced. Even then, no deposits had formed and the oil was in good condition.

Savings in oil costs—just count them incidental, if you wish. But think of the production time you'd save if your reduction gears and oil circulating systems could be operated two to four times as long before they needed cleaning.

Discuss maintenance problems with a Standard Lubrication Engineer. See if he hasn't suggestions that will help you cut down lost machine time.

TO HELP YOU GET VICTORY PRODUCTION . . . .

As a means of conserving the machines and tools of industry so vital to Victory Production, Standard Oil Company (Indiana) urges plant officials to take advantage of the Lubrication Engineering Service that is available to all manufacturers in the Middle West.

Demands on equipment have been stepped up—lubricating requirements have changed. Lubricating problems similar to those in your plant may have been solved by these Engineers just a week or a month ago in other plants. You can have the advantage of their up-to-the-minute information on lubrication and lubricant developments at no cost to you. Just write Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha.

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STANDARD OIL COMPANY (INDIANA

Keep those boilers going!
● A year ago it was bad enough when a boiler had to be shut down for repairs to the setting. But today a delay that upsets your production schedule is a downright tragedy. It's not only costly to you, but serious to customers who depend upon you for badly needed supplies.
The installation of "Carbofrax" along the clinker line on side walls and in front and bridge walls is one sure way of providing for continuity of operation. Besides eliminating frequent and untimely outages, due to lining failures, the use of "Carbofrax" brick insures maximum steam production because clinker does not build out on them. With the full effective grate area thus maintained, combustion conditions are vastly improved and greater efficiency results.
"Carbofrax" brings you these benefits because of its extremely high refractoriness—outstanding resistance to spalling, cracking and clinker adhesion.
Regardless of the purpose for which you develop steam and whether it be in the steel mill, forge shop, process industries, etc., continuous boiler operation is especially important during these turbulent days. Why not call on our representative to explain in more detail how "Carbofrax" will help you attain uninterrupted service and at the same time lower your refractory and maintenance costs.
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THE CARBORUNDUM COMPANY
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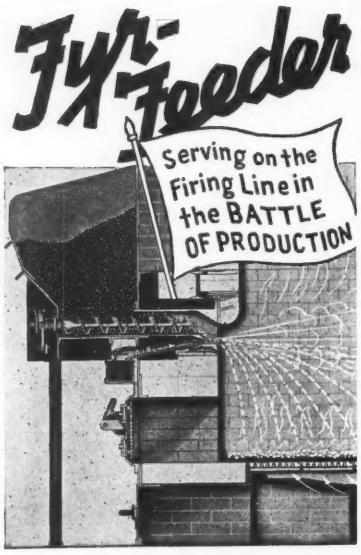

"BEST STOKER BUILT"

HUNDREDS of users of the "up-to-the-minute" *multiple* FYR-FEEDER praise the EFFICIENT, DEPENDABLE, ECONOMICAL service they have been getting ever since changing over to this *most* modern firing system. Engineers say it's the best and finest stoker built and you will agree with them if you install it under your boilers.

Why go on with "out-of-date" firing methods when you can have the Multiple FYR-FEEDER Spreader Stoker do a wonderful job for you?

SIMPLE, AUTOMATIC, FOOLPROOF!
BURNS COAL LIKE OIL!

- FYR-FEEDER means less work for the fireman. Makes firing automatic and E-A-S-Y! Takes all the hard work out of cleaning fires—no clinkers to struggle with—no slice bars need be used.
- FYR-FEEDER increases boiler steaming capacity. FYR-FEEDER burns cheapest coal at highest efficiency. FYR-FEEDER uses local coals and saves VITAL transportation facilities now so urgently needed in the War effort. FYR-FEEDER reduces smoke because it produces accelerated or "instant" and perfect combustion.
- FYR-FEEDER does a perfect firing job with a thin fuel bed—with never more than an average of a half inch of coal on the grate.

FYR-FEEDER will help you cut your steam costs. Wire your order for FYR-FEEDER today, or write today for full details.

TERRITORIES FOR SALES ENGINEERS

Some territories are open for experienced sales engineers familiar with steam plant boilers and furnaces. Information on request. Please furnish record of your experience and references.

AMERICAN COAL BURNER COMPANY, *ENGINEERS*
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☐ Please mail descriptive literature.
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until the winter of 1943-44, more than a year later.

Further, the need for additional capacity in the Northwest is admittedly pressing. A shortage is considered likely to develop in this area this fall, because heavy war loads are coming in faster than capacity can be added.

Final determination of the emergency shift of two units hinges upon working out various financial and legal problems, it is considered certain to go through. Technically, engineers say the plan is feasible. The program suggested by WPB calls for pushing completion at the earliest time of the initial Shasta Units, which have been ordered and are now being built.

These would be installed in the positions at Coulee intended to house that project's 108,000 kw. generators. By speeding work at Coulee, however, enough positions can be made ready to continue installation of the 108,000 kw. units as scheduled—Nos. 4-6 in the summer of 1943, Nos. 7-9 in 1944.

Meantime, work could be continued at the present pace on Shasta so that its other three units could be installed and ready for service in January, 1944, the currently scheduled date for beginning of operation of all five generators. Ultimately, it is expected the emergency installations at Coulee would be moved to their originally intended locations.

Air Corps Training Schools in Texas

WAR DEPARTMENT, Washington, D. C., has authorized the construction of eight new Air Corps training schools at different points in Texas, representing a gross cost in excess of $50,000,000. The scheduled projects are as follows:

Air force school with complete operating facilities at Amarillo, to cost over $5,000,000, and carried out under direction of United States Engineer Office at Denison, Tex. The same office will also be in charge of a similar project in the vicinity of Greenville, estimated to cost close to like amount.

Schools at Waco, Eagle Pass, Big Spring and San Angelo, each to cost in excess of $5,000,000, to be constructed under direction of the United States Engineer Office, Galveston, Tex. Plans for the project at San Angelo, will be prepared by Mark Lemmon, architect, and Myers & Noyes, consulting engineers, all in the Tower Petroleum Building, Dallas, Tex.

The two other Air Corps schools will be located in the vicinity of Hondo and Lubbock, respectively, each to cost over $5,000,000. The one at Hondo will be carried out under supervision of the United States Engineer Office at San Antonio, Tex., while the Lubbock project will be in charge of the United States Engineer Office at Albuquerque, N. M.

Each school will comprise a series of hangars, machine and mechanical shops, equipment and supply storage and distributing buildings. and other operating structures, with administration buildings, barracks and miscellaneous structures.

Complete electrical facilities will be installed, including power substations to secure power supply from central stations in the respective area; electric light and power lines, underground lighting installations, airfield lighting equipment and other electrical distribution facilities. Boiler plants and pumping stations will also be installed.

ABP

What This Symbol Means To You

Banded together in The Associated Business Papers, Inc., is a group of 140 dominant business publications serving virtually every industrial, professional and merchant group in the land. We believe that it is in the best interests of our subscribers to align *Power Plant Engineering* with these leaders who are pledged to uphold the highest standards in publishing and editorial content. Through the constant exchange of publishing lore in our association with them, we can be of greater value to our readers.

Although approximately 1600 so-called business papers are listed in various references, the standards of publishing practice maintained by members of The Associated Business Papers, Inc., are so rigid that less than 200 of this total group qualify for membership.

For one thing, qualifying papers must maintain membership in the Audit Bureau of Circulations, whose impartial audits show advertisers exactly how many interested readers, like yourself, voluntarily pay for their business papers. And each A.B.P. publication must be independently operated, editorially unfettered, ethically administered.

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Useful Data on Alloys for Power Engineers

Booklet on INCO Nickel Alloys covers Corrosion and Heat Resistance, Mechanical Properties, Applications and Forms

THE twin advantages of strength and resistance to corrosion are well-known attributes of Monel,* Nickel and Inconel.* This same combination of properties is also characteristic of the five newer INCO Nickel Alloys . . . "K" Monel,* "R" Monel,* "KR" Monel,* "S" Monel* and "Z" Nickel.*

In addition, however, each of these alloys possesses individual properties such as heat resistance, extra hardness, spring properties, free-machinability and others. For a given application, therefore, there is one INCO Nickel Alloy which from the standpoint of fabrication, service, or both, will prove more suitable than the others.

Comparative data on all of these metals is accordingly desirable. Such information has been compiled and published in the booklet, "Individualized INCO Nickel Alloys." For copies of this booklet, please mail the coupon below.

★ ★ ★

INCO *Nickel Alloys in War Effort* With the Nation at war, every pound of Nickel, Monel and Inconel that expanded facilities can produce is urgently needed for vessels of the Navy, mechanical and chemical equipment for the Army, vital parts of Aircraft, and for Chemical, Petroleum, Steel and other essential industries. As part of the all-out war effort the International Nickel Company will continue to report for the benefit of such users information concerning the selection, fabrication and use of Nickel and Nickel Alloys.

THE INTERNATIONAL NICKEL COMPANY, INC.
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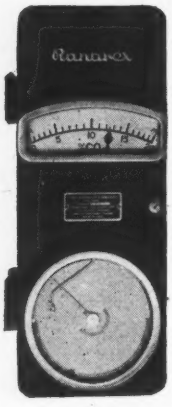
Cut waste sharply with Ranarex*



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Watch CO_2, as recorded by Ranarex, and you reduce heat loss in the flue gases. This tough instrument is all mechanical—no chemicals or fragile parts to break down under 3-shift strain. Yet it gives accurate readings—instantly!

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PERMUTIT

Fuel for Production of Electric Energy

ELECTRIC UTILITY power plants consumed 6,156,018 t. of coal in December, 1941, the Federal Power Commission reported recently. Of the total, 5,915,916 t. were bituminous coal, an increase of 6.9 per cent over November consumption, and 240,102 t. were anthracite, an increase of 1.8 per cent over November consumption.

Fuel oil consumed in December totaled 1,937,905 barrels compared to 1,731,316 barrels in November, an increase of 11.9 per cent. Gas consumption in December rose 2.9 per cent over that consumed in November. In December 17,109,075 m.c.f. of gas were consumed compared to 16,634,442 m.c.f. in November.

Total stock of coal on hand at electric utility power plants on January 1, 1942, was 14,078,010 t., a 2.3 per cent increase over the stock on hand December 1, 1941 and a 12.2 per cent increase compared to the stock on hand January 1, 1941. Of the total January 1, 1942 stock, 12,820,532 t. were bituminous coal and 1,257,478 t. were anthracite. These represent an increase of 3.2 per cent in stocks of bituminous coal on that date and a decrease of 6.1 per cent for anthracite over stocks on hand December 1, 1941.

In terms of days' supply, based on the rate of consumption in the month in question, there were sufficient stocks of bituminous coal on hand January 1, 1942, to last 67 da. and sufficient stocks of anthracite for 162 da. requirements. On December 1, 1941, there were stocks of bituminous on hand for 67 da. and of anthracite for 170 da.

See page 74 of our new 96-page catalog for information on this

ELECTRIC WATER SERVICE VALVE

This Valve closes automatically whenever solenoid is energized, and opens whenever solenoid is de-energized—*or vice versa.* Solenoid is furnished for either AC or DC circuit for any voltage.

The Valve operates at all times, under any pressures, without shock or bang, owing to the inherent air and water cushioning.

GOLDEN-ANDERSON VALVE SPECIALTY CO.
Fulton Building Pittsburgh, Pa.

Obituaries

Cary D. Waters died on May 9 as announced by the C. J. Tagliabue Mfg. Co., Brooklyn, N. Y. Mr. Waters was president of the corporation.

Richard L. Yates

RICHARD L. YATES, 59, vice president and general manager of Skinner Engine Co., Erie, Pa., died of a heart attack at his home, April 19. Apparently in good health, his sudden death came as a shock to his many friends.

Born in Washington, Mich., on December 2, 1882, Mr. Yates received his early education in the local schools and later was graduated from Michigan State College with a degree in Mechanical Engineering. In 1918 he came to Erie as general manager of the Skinner Engine Co. His ability was well known throughout the power field.

Morris S. Towson

MORRIS S. TOWSON, 76, president and general manager of the Elwell-Parker Electric Co., Cleveland, died recently in Orlando, Fla. Mr. Towson, born in Cleveland, was a graduate of Case School of Applied Science. He was associated for several years with the Brown Hoisting Machinery Co., and in 1893 when a separate company was formed to build the Elwell-Parker motor, under British license, was placed in charge. A pioneer in the power truck industry, he was active in

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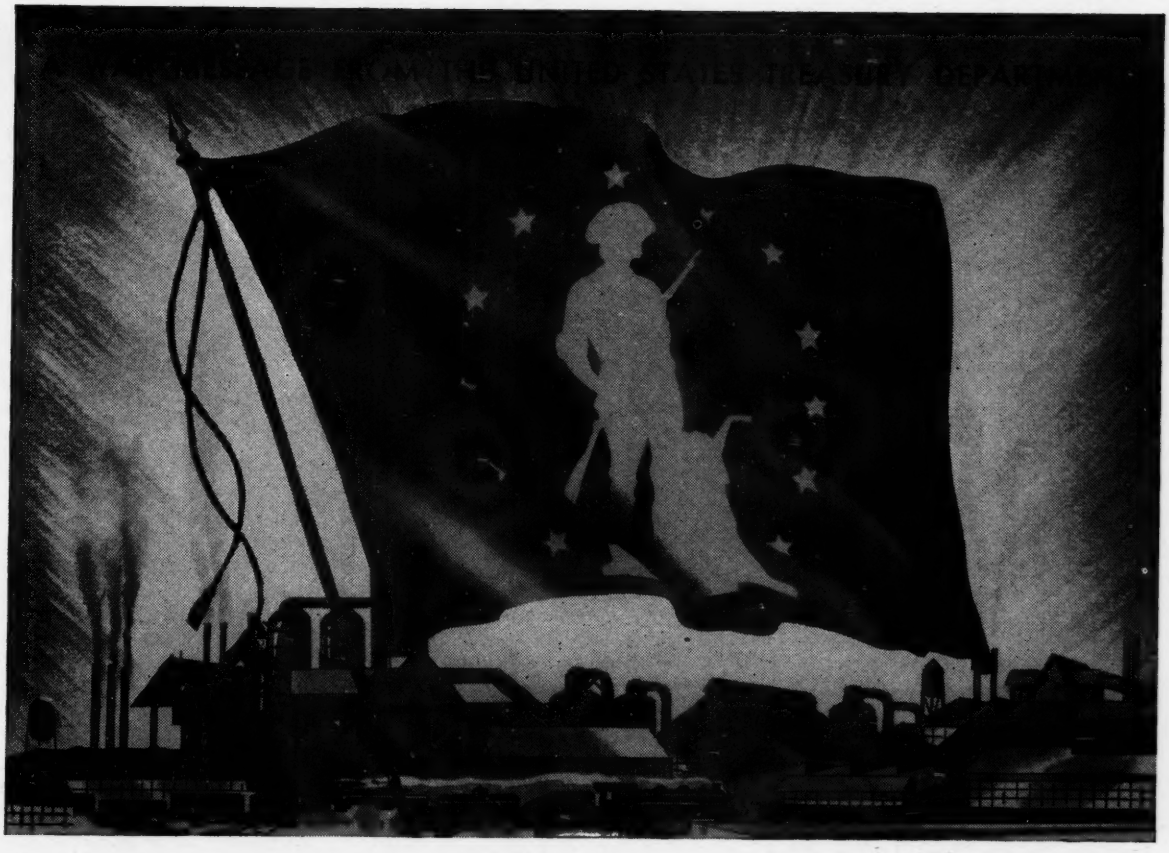

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IT doesn't go into the smoke of battle, but wherever you see this flag you know that it spells Victory for our boys on the fighting fronts. To everyone, it means that the firm which flies it has attained 90 percent or more employee participation in the Pay-Roll Savings Plan . . . that their employees are turning a part of their earnings into tanks and planes and guns *regularly,* every pay day, through the systematic purchase of U. S. War Bonds.

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If your firm has already installed the Pay-Roll Savings Plan, now is the time to increase your efforts: (1) To secure wider participation and reach the 90-percent goal; (2) to encourage employees to increase their allotments until 10 percent or more of your gross pay roll is subscribed for Bonds. "Token" allotments will not win this war any more than "token" resistance will keep our enemies from our shores, our homes. If your firm has yet to install the Plan, remember, TIME IS SHORT.

Write or wire for full facts and literature on installing your Pay-Roll Savings Plan now. Address Treasury Department, Section D, 709 12th St., NW., Washington, D. C.

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its commercial development, which began in 1906, and held patents on many basic features which were incorporated in power industrial trucks, prior to World War 1, which use was largely confined to railroad and marine terminals.

Robert F. Vogt

ROBERT F. VOGT, 62, chief consulting engineer of the Allis-Chalmers Mfg. Co. since 1937 and an employe of the company for 36 yr., died recently after a short illness. Mr. Vogt's professional career began in the United States about 40 yr. ago, when he came here from Switzerland. He was a graduate of the Swiss Polytechnicum at Zurich. He joined the Allis-Chalmers organization in 1907 as a mechanical engineer and in 1921 was appointed assistant chief consulting engineer. In 1937 he succeeded J. F. Max Patitz as the company's chief consulting engineer. He is survived by his widow and a son. He was a member of the A.S.M.E. and the S.A.E.

R. E. Hellmund

R. E. HELLMUND, 63, chief engineer of the Westinghouse Elec. & Mfg. Co. and one of the Nation's foremost electrical engineers, died May 16, in New York City, after a brief illness. He was the recipient of many engineering honors and held more than 300 U. S. and foreign patents.

Mr. Hellmund, born in Gotha, Germany, received his engineering training at the Technical College of Ilmenau, Germany, and the University of Charlottenburg, Germany. He came to this country in 1903 and joined Westinghouse in 1907 after several years' experience in the design of electrical machinery both here and abroad. From 1912 to 1917, he was in charge of designing all a.c. and d.c. motors for light and heavy traction and later supervised the planning, executing, and financing of all new engineering developments. In 1926 he was appointed chief electrical engineer and acted as chairman of the Patent board, advising on the purchases of ideas and inventions offered the company from outside. Mr. Hellmund was appointed Chief Engineer in 1933.

L. A. S. Wood

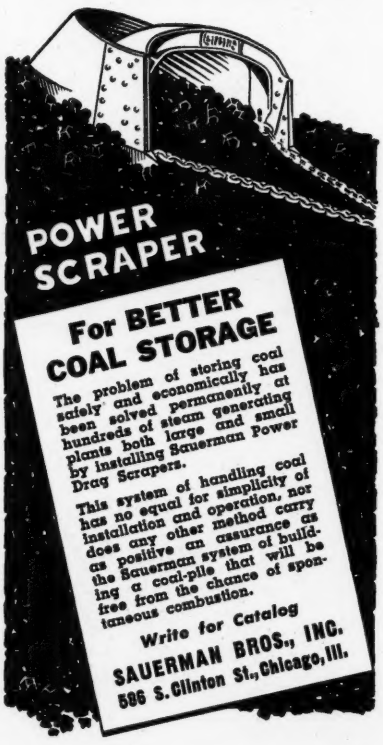
L. A. S. WOOD, Chief Lighting Engineer, Westinghouse Elec. & Mfg. Co., Cleveland, and international authority of street and highway lighting practices, died May 6, after a brief illness.

Mr. Wood came to this country in 1911, having received his engineering education at Finsbury Technical College, England, and was associated with the George Cutter Co. as an engineer and later as salesmanager.

Among the prominent accomplishments of his career are included the design and plan for the street lighting system of St. Louis, the largest individual street lighting system in the country. He also served as consultant for the lighting of the Chicago Exposition, the Great Lakes Exposition, Cleveland, and the Philadelphia Sesqui-Centennial, in 1926.

President of the I. E. S. in 1935, he was made chief lighting engineer of the Westinghouse Elec. & Mfg. Co. with headquarters in New York. He returned to Cleveland in 1936.

SAUERMAN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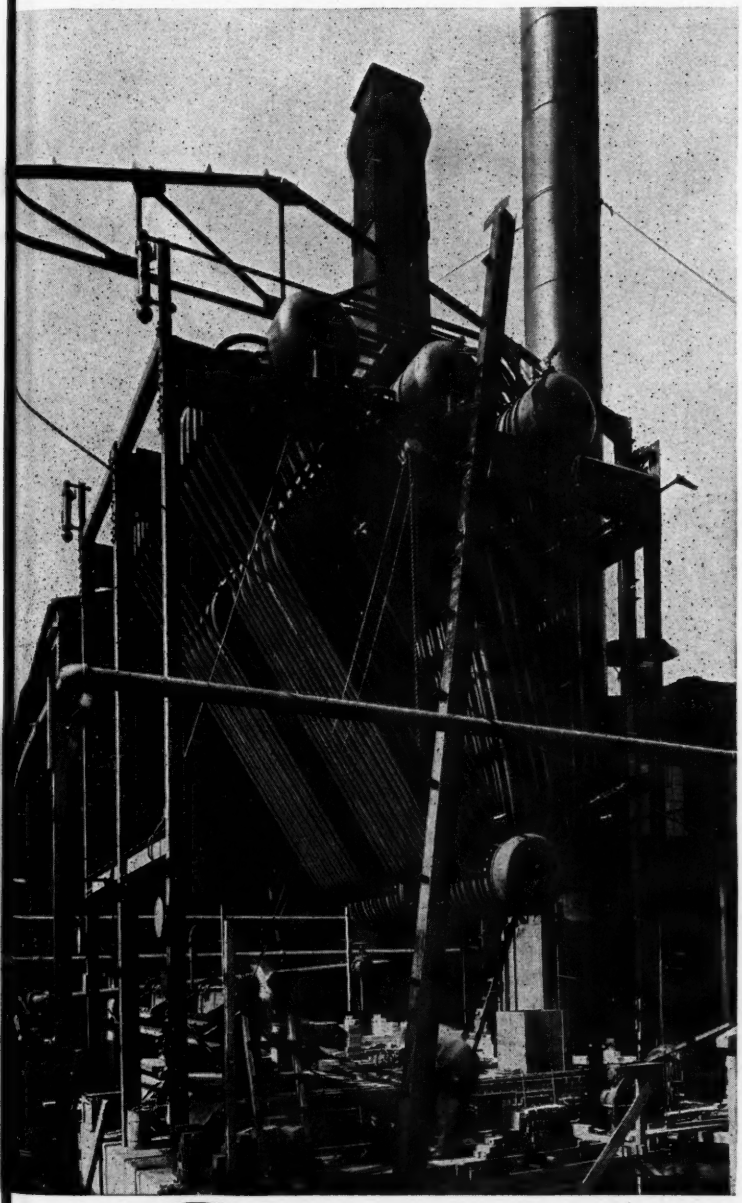

With *Production for War* making greater demands than ever before in our industrial history—with the military value of one plane, tank, gun or ship available today probably worth that of a dozen tomorrow—everything depends on industrial power.

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And Republic ELECTRUNITE Boiler Tubes are helping maintain an adequate supply of power in plants throughout the country.

Republic ELECTRUNITE Boiler Tubes are fabricated from flat-rolled steel and are electric resistance welded, insuring constant uniformity in diameter, wall thickness, roundness, ductility, strength and smooth scale-free surface. Every tube is thoroughly tested before shipment at a pressure within 20% of the minimum yield point of the steel.

Because they are easy to install (users report up to 30% savings) and they can be depended on for long, trouble-free service, the entire present output of Republic ELECTRUNITE Boiler Tubes is earmarked for *Production for War.* This sometimes forces us to say "Not now" to our friends and old customers.

If your business is a part of a war industry, you'll want to know immediately about the saving accomplished by Republic ELECTRUNITE Boiler Tubes. In any event, you'll want to be informed about their superior performance. Write for details.

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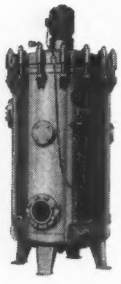
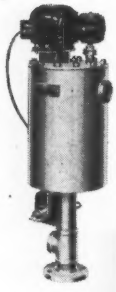


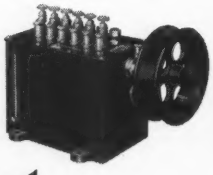
The self-cleaning filter (left) for lubricating oils and coolants has many special features. Various porosities and capacities are available.

The small self-cleaning filter for oils and coolants fills many needs.

Mechanical force-feed lubricators in various types from 1 to 28 feeds are available. Timed lubricators for Diesel cylinder lubrication may be had.

Turbine Oil Conditioners in various sizes for oils requiring acid correction — and to prevent build up of acid in new oil.





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LUBRICATING OIL EQUIPMENT
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LUBRICATING • FILTERING • DISTILLING

New Victory Sash to Save Steel

(Continued from Page 67)

Muntins in conventional wood sash generally are made in molded sections which reduce their strength and form beads that collect dirt and moisture and are difficult to paint thoroughly. Sash and muntins in the new sash are simple in their design and relationship. Molding cut-outs are eliminated. And thus the maximum wood section is maintained for maximum strength. The wood is beveled to provide a run-off for any moisture that may accumulate.

Glazing is done on the inside, rather than the outside, so that the weaker part of the wood section and the putty are protected from the weather. The glass is secured on the inside by means of standard spring glazing clips such as are used in steel sash.

To remain in place for maximum lengths of time, the putty in all types of sash at present depends entirely upon adhesion to wood or steel to hold itself in place. Putty on the outside tends to terminate in a feather edge, so-called, when it starts to dry. Thus, it goes through the successive processes of curling, then disintegrating and loosening up around the glass.

In the Victory Sash section, however, a raised lug is provided on the inside of the mullion and muntin, and this provides a footing for a definite thickness of putty. Next to the lug is a glazing clip groove which serves also as a putty anchor. Since putty tends to adhere more firmly to glass, there is far less chance, with this arrangement, for it to curl away from the wood surface.

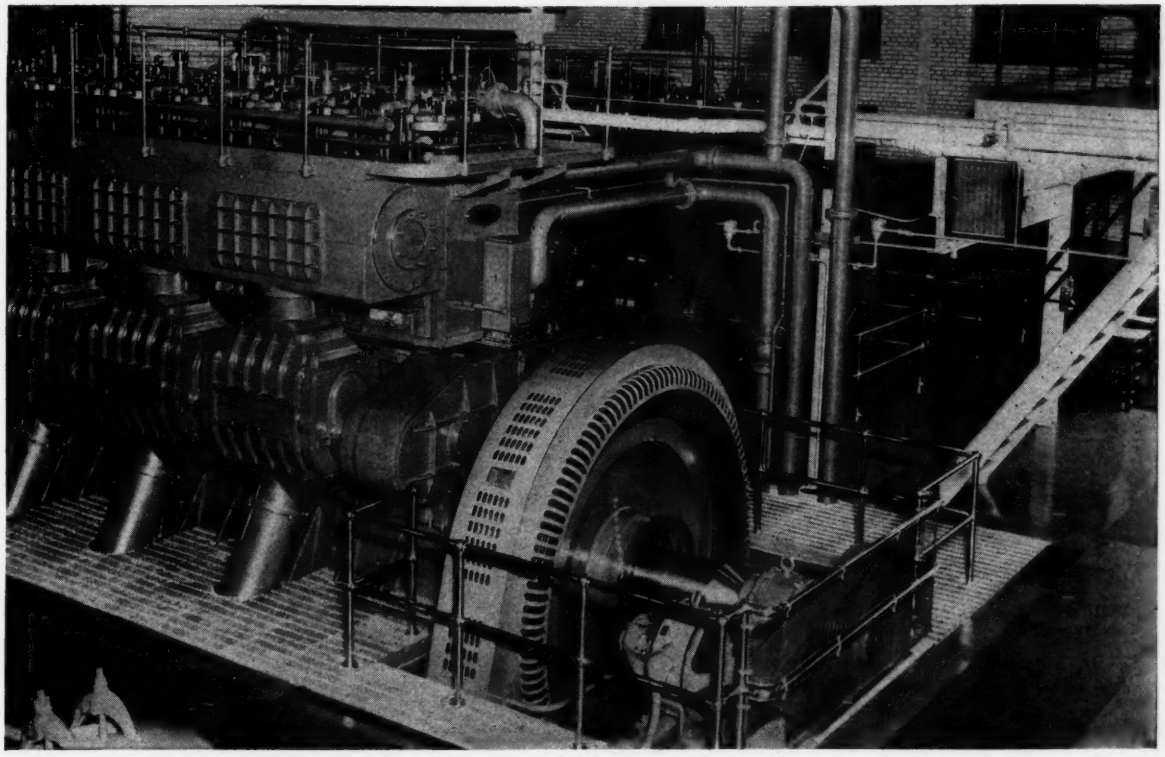
Design of the muntins is such that the mortising of intersecting members is accomplished without impairment of their strength. Mortises are located inside the sash, away from the weather. The ventilators in conventional wood sash have well known disadvantages, whether double-hung or pivoted. They expand in wet weather and contract when the atmosphere is dry. Hence, they stick and are difficult to operate when it rains and humidity is high, or they are too loose when the weather is dry.

Victory Sash has borrowed its ventilator from steel sash which, through years of development, has reached a high degree of perfection. The steel ventilator designed for use in wood sash is made complete with hinges, pivots, slides, push bar and chain pull. It can be adapted to gang, hand or motor operation. The amount of steel involved in the ventilator, by comparison with the amount of fixed wood sash in a given building, is so small that it can hardly be considered a drain on the steel supply.

A decided advantage offered by this type of ventilator is that any future time when realinement of a manufacturing operation calls for more ventilation, this can be achieved without any difficulty at all. The light wood muntins can be removed. And a standard ventilator can be installed without any further changes whatever.

It was pointed out that the Victory Sash was developed primarily as a substitute for steel sash, but should have many logical uses after the war. For one thing, it would serve well where severe acid conditions prevail. And wood, properly maintained, withstands better than steel the effects of salt air.

The new sash is ideal for use in factory or office partitions. It has sufficient strength, under ordinary



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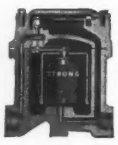
Steam costs money. The "big shots" know it. And when their new battery of cookers uses 27% LESS, they want to know why. I'm still wonderin' why they gave me an office with my name on the door for tellin' them plain horse sense like this:



1 STRONG 70-T TRAP for quick-heating cookers, etc. Lets out all the air. Shuts tight soon as steam hits it. Can't dribble because of the exclusive anti-balancing device. Packs as much quality as Strong's larger inverted bucket (80 series) trap. Guaranteed a year.

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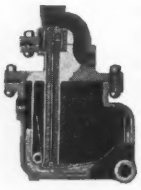

2 STRONG 30 REGULAR TRAP for any drainage job, particularly separators, headers, engine manifolds. Install one and watch it work. You'll still be patting yourself on the back 10, 15 years from now, on account of the Anumetl valves and seats and wear-proof parts.

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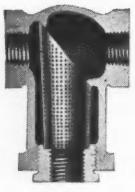

3 STRONG, QUICK-CLEANING STRAINER. Makes reducing valves, traps, controls, etc., live longer and work better, by taking out scale, dirt, grit or sand. Just open the blow-off to clean it.

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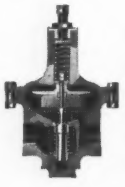

4 STRONG REDUCING VALVES. Type K of complete line shown. Name your own reduced pressure from 85 pounds down, and this valve keeps right on giving it to you. ANUMETL valves and seats guaranteed for a year.

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STEAM SPECIALTIES

conditions, to extend up to extreme ceiling heights without reinforcing. When in use as a partition the lower portion of a section of Victory Sash can be glazed with plywood or similar material. Or where flush partitions are required, plywood can be fastened to both sides.

Also the sash is of sufficient thickness to accommodate doors, with mullions serving as the door jambs. Each door unit replaces a sash unit. The door and sash can be readily interchanged. It is easily adapted to blackout requirements. Sheets of plywood can be fastened to the outside of the sash, with sections cut out to accommodate the ventilators. The ventilator units, themselves, can be given blackout treatment by means of various approved methods. Thus, ventilators can be operated except during periods of air raid alarms.

Because it is secured directly to the wood in the sash, the plywood is very close to the glass. Thus, in the event a bomb exploded nearby, the plywood would absorb the main shock and there would be a minimum of flying glass to endanger workmen. The plywood can be painted on the outside in camouflage colors. And its inside surface can be covered with a light reflecting paint.

Wood sash may not be cheaper to fabricate than steel sash. But since large quantities of steel may thus be released for vital war purposes, the Government now requests the use of wood sash in industrial buildings.

New Engineering Books

Machine Shop Training. A series of job training units developed by the staff of the Dunwoody Industrial Institute. Copyright 1942, size 10⅞ by 8½ in., pages range from 40 to 155 p., paper spiral bound. Published by the American Technical Society, Drexel Ave. at 58th St., Chicago, Ill. Prices range from 75 ct. to $1.35.

THE INSTRUCTOR'S GUIDE. This guide furnishes helpful information and suggestions regarding all the job training units of the Dunwoody series, among which are manuals on bench work, drill presses, grinders, lathes, milling machines, and shapers and planers. The book also covers the use of the manual itself; the organization and devices for efficient shop control, and control of the training experiences, and methods of instruction. 40 p., price 75 ct.

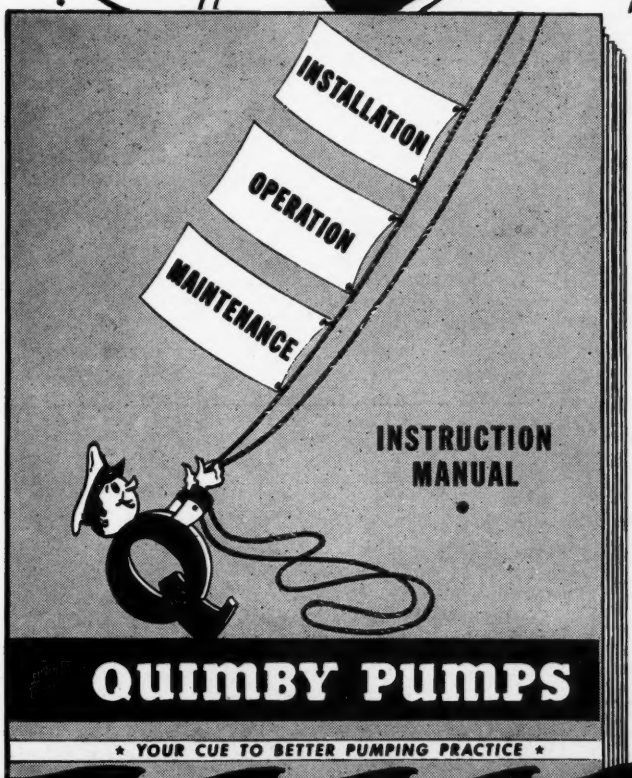
BENCH WORK. This book, in manual form, covers various jobs on layout and bench work; including floor work, use of standard bench equipment and hand tools. The manual lists 34 jobs and each includes a list of materials and tools needed, general instructions and a step by step procedure of working operation. Complete details of each job are thoroughly illustrated; and each has a list of precautions, references and a questionnaire check sheet. 155 p., price $1.35.

DRILL PRESS. Jobs in connection with the setting up and operation of various types of drill presses are covered in this book. These jobs give practice in the various operations and processes performed on different machines; in the selection and use for different purposes of drill press tools and devices; and the use of measuring tools and calculations. Included with the general procedure of following the course are objectives, specific procedure for the shop work, and a description of the necessary equipment, together with a job instruction sheet, a questionnaire check sheet, precautions, detailed illustrations and references. 103 p., price $1.25.

GRINDER. Jobs on the inspection, care and use of the cylindrical, surface and tool and cutter grinding machines, and the use also of precision and semi-precision measuring tools and devices in performing grinding jobs are dealt with in this book. The job list includes 28 jobs and each is well illustrated in detail. Instruction sheet, shop work procedure, care and use of necessary tools, questionnaire check sheet, precautions and references are also included. 111 p., price $1.25.

LATHE. This lathe book covers jobs on the engine lathe, the turret lathe and the hand screw machines. In addition, it includes common methods of laying out work for center drilling and for grinding lathe tools. The manual lists 43 jobs with some repetitive work to give the learner additional practice to fix skill and understanding. The jobs are progressive, each using old operations and skills previously taught and introducing one or two new ones. Job instruction sheet with a step by step working procedure, equipment needed, are included in addition to objectives, ques-

A LIFE SAVER TO ALL PUMP USERS!



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Many pumps now in service cannot be replaced until after the war so it is essential that their effectiveness be maintained. Whether you operate a Quimby Pump or some other type you will find many practical suggestions in the new Quimby Instruction Book to assist you in getting the most effective service from new or existing equipment.

This useful, "dirty-hand" information is offered to instruct those whose experience may be limited and to serve as timely reminders for more highly trained personnel. Typical subjects covered are,

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Each major subject is illustrated with animation to place interesting emphasis on essential points.

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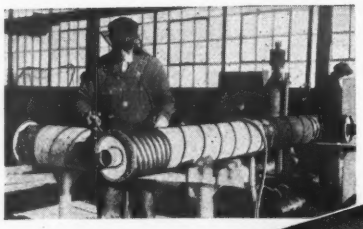
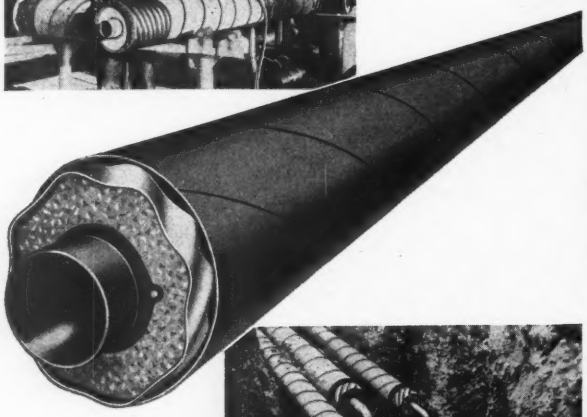
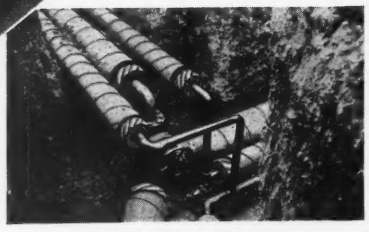


Half of expansion U-Bend, with service connection (end flanged for welding.)





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Agents in Principal Cities

tionnaire check sheet, precautions and references. 143 p., price $1.35.

SHAPER AND PLANER. Jobs in connection with the setting up and operation of shapers and planers are covered in this book, and give practice in the various operations and processes performed on these machines. Practice is also given in the selection and use for different purposes on shaper and planer tools and devices; and in the use of measuring tools and calculations. All the jobs are listed in the order of their presumed difficulty to the learner, and done in a step by step procedure. Job instruction sheet, list of equipment needed, questionnaire check sheet, precautions and references are included with important usable shop knowledge listed in the appendix of the manual. 115 p., price $1.25.

Machine Tools At Work. By Charles O. Herb, Copyright 1942, 1st Edition, size 6 by 9 in., 544 p., 434 illustrations, cloth bound. Published by The Industrial Press, 148 Lafayette St., New York City. Price $4.00.

This book deals thoroughly with machine tools in action, and shows actual examples of shop practice which have been carefully selected from the best equipped shops in America to illustrate a wide range of applications of modern machine tools.

While this book illustrates the machining of actual machine parts of many kinds, the primary purpose is to show the application of fundamental principles which may be utilized in any kind of production where there is a similar manufacturing problem.

The illustrations represent jobs, special and unusual, on a large variety of the most modern types of machine tools, such as are used for turning, drilling, milling, planing, grinding, broaching, etc. Clear, close-up views show not only the actual machining operations but the tooling, working, and other auxiliary equipment. These views are all accompanied by the main facts about each job, with specific data on speeds, feeds, production rates, etc., in many cases.

The purpose of this book is to present condensed illustrated descriptions of the more unusual operations on many different types of modern machine tools, and is intended chiefly for those who have at least a fair knowledge of machine shop practice. They are also intended for advanced or graduate apprentices, machinists, and for shop executives interested in the equipment and procedure employed in many different types of machine-building plants.

The Second Mile by William E. Wickenden, President, Case School of Applied Science, is the title of a pamphlet procurable from the Engineer's Council for Professional Development, 29 W. 39th St., New York City, at 10 ct. per copy, 5 ct. in quantities, or $3.00 per hundred. The pamphlet is a revision of an address delivered before the Engineering Institute of Canada and sets forth in an interesting way the manner in which individuals or groups may raise their occupational pursuits into professions, with special reference to engineers.

FOR THE ENGINEER'S LIBRARY

Coupon for obtaining free literature listed here may be found on page 144, under the heading Helpful Bulletins.

Electrical Equipment

1 Electrical Equipment—A new 16-p. catalog listing over a thousand stock items in rheostats, resistors, tap switches, chokes and attenuators has been issued recently for engineers and purchasing departments as a quick-reference specification or buying guide. It gives illustrations, descriptions, ratings, prices and other information on the wide range of stock types and sizes. Ohmite Mfg. Co.

2 Circuit Breakers—A 12-p. illustrated catalog discusses various methods of tripping, describes attachments that can be supplied, gives characteristics of each size and shows dimensions and typical control diagrams of oil circuit breakers. Roller-Smith Co.

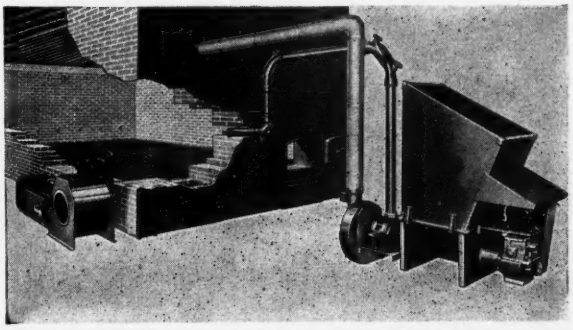
3 Switchboards—Modern switchboards, custom built, are completely described in Bulletin B-6149. Vertical and duplex panels, benchboards and control desk are covered. Allis-Chalmers Mfg. Co.

IRON FIREMAN P.S.* STOKERS

Produce More Steam for War Production

QUICKLY INSTALLED

★ *Pneumatic Spreader*



This diagrammatic view shows the operation of the Iron Fireman Pneumatic Spreader stoker. Steam-size coal is conveyed from the hopper (at right) or bunker, to a transfer housing. Here the coal is picked up by a stream of high-velocity air and conveyed to the furnace and grates. The fines burn in suspension, utilizing the conveying air for combustion. The larger pieces form a shallow fuel bed on the grate. By means of an adjustable nozzle, the coal is distributed uniformly over the entire grate surface. Entering at right angles to the flow of under-grate air through the fuel bed, the conveying air produces maximum turbulence.

FOR increased "fire-power" in your plant, to speed America's all-out war of production, enlist Iron Fireman stokers. These self-contained stoker units are being quickly installed in boilers of all types, developing up to 1,000 h.p. They are conserving the nation's fuel supply by burning coal and are substantially reducing coal tonnage requirements. In addition, Iron Fireman stokers are stepping up steam output 10% to 35% in war production plants, and are making large savings in fuel costs.

Iron Fireman stokers help eliminate "steam bottlenecks" by providing an ample and dependable supply of steam. They respond quickly to meet peak-load conditions, both in power and heating applications.

If you are faced with fuel changes or increased loads, why not find out now how quickly Iron Fireman equipment can be installed, and what it will accomplish in your plant?

A Typical Example of Iron Fireman Pneumatic Spreader Performance

Textile Plant Doubles Production

Uses Same Boilers with P. S. Firing. War orders have more than doubled the production of the American Pad & Textile Co., Greenfield, Ohio . . . yet the plant has been able to operate with the same boilers as before, and with no increase in fuel costs.

Plant of American Pad & Textile Co., Greenfield, Ohio.

This record has been made possible by three Iron Fireman Pneumatic Spreader Stokers in the 200 h.p. boilers.

W. O. Skeen, mechanical engineer of the plant, reports: "The Iron Fireman Pneumatic Spreader is able to hold the steam pressure practically constant, even with widely fluctuating loads.

"The upkeep cost of furnaces has been reduced more than 50%, owing to the elimination of the cutting effect of the air blast on the sidewalls, caused by the previous type of firing unit, which the spreader type replaced.

W. O. SKEEN
Mechanical Engineer, American Pad & Textile Co.

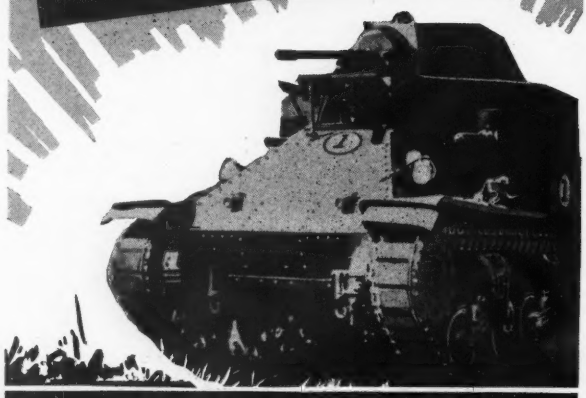
"Cleaning of ash from the grates is done in a few minutes, under full load, without loss of steam pressure. With the previous unit, there was a very considerable loss of coke, and cleaning had to be done at times of reduced demand for steam."

☆ ☆

Learn what Iron Fireman firing can accomplish for *you*. We are ready to make an immediate engineering survey of your steam plant, in cooperation with your own plant or consulting engineer. No cost or obligation. Write Iron Fireman Manufacturing Co., 3316 W. 106th Street, Cleveland, Ohio.

IRON FIREMAN **AUTOMATIC COAL STOKERS**

KEEP 'EM ROLLING



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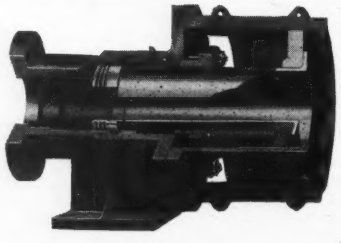
Avoid costly shutdowns. Install ADSCO Piston-Ring Expansion Joints — the only slip type joints that can be UNPACKED and REPACKED under full operating conditions without interruption to service.

Piston rings in the internal guide hold the line pressure during unpacking and repacking operations.

ADSCO Piston-Ring Expansion Joints are FULLY GUIDED by internal and external guides. Available in single or double joints for high pressure, high temperature service—flanged or beveled ends. Write for Bulletin 35-15-P.

ADSCO
PISTON-RING EXPANSION JOINT
for steam, hot water, oil or gas lines



AMERICAN DISTRICT STEAM COMPANY North Tonawanda N. Y.

Making "UP-TO-DATE" Steam Line Equipment for over 60 Years

Can Be Packed Under Pressure

4 **Electrical Equipment**—A quick selector catalog No. 30-000 for many types of electrical equipment such as safety switches, nofuze breakers, multi-breakers, motor controls and motors. Electrical ratings, physical dimensions and circuit diagrams are included for the selection of the correct equipment. Westinghouse Elec. & Mfg. Co.

5 **Electrical Instruments**—Booklet B-3013 deals with electrical instruments for industrial, central station, laboratory, and general use and portable switchboards, miniature panel instruments are also described in this new 34-p. booklet. Special features, specification data, and full scale range of standard ratings are included. Westinghouse Elec. & Mfg. Co.

Instruments and Control

6 **Meters and Controls**—Bulletin No. 16, How to Stretch Steaming Capacity Successfully contains a check list of procedure for boiler room improvement, with explanations as to how the proper use of metering and control equipment stretches steam capacity, avoids frequent shutdowns for maintenance, insures safety of men and equipment, furnishes data for comparison of fuels, reduces fuel consumption, and maintains efficiency while new operating crews are being trained. Bailey Meter Co.

7 **Speed Indicators**—A 4-p. Bulletin G-427 describes a new type electric remote speed indicator. Working data on the auxiliary equipment are included with illustrations. Reeves Pulley Co.

8 **Absolute Pressure Gages**—Advantages of, details of construction, and, methods of operation are subjected to a full discussion on absolute pressure gages in a new 8 p. illustrated Bulletin No. 70-11. Brown Instrument Co.

9 **Pressure Instruments**—Information on gages (differential and absolute pressure and vacuum) is listed in a new 22-p. catalog 76JF. Covered also are indicating mercury gages for absolute pressures and vacuums and charts for pressure recorders and controllers. Taylor Instrument Cos.

10 **Combustion Control**—Bulletin 15 describes electrically actuated combustion control regulators and systems. Small boiler installation is discussed and information is included on the electric eye system. Brooke Engineering Co., Inc.

11 **Regulators**—Temperature regulators for heat control in industry are covered in a 16-p. Bulletin 600. Various types of regulators are discussed and information on capacities and sizes given in table form. A chart is included on valve dimensions. Sarco Co., Inc.

Paints, Coverings and Compounds

12 **Paint**—Information on the painting of concrete, stucco and masonry surfaces is furnished in an 8-p. bulletin. Medusa Products Co.

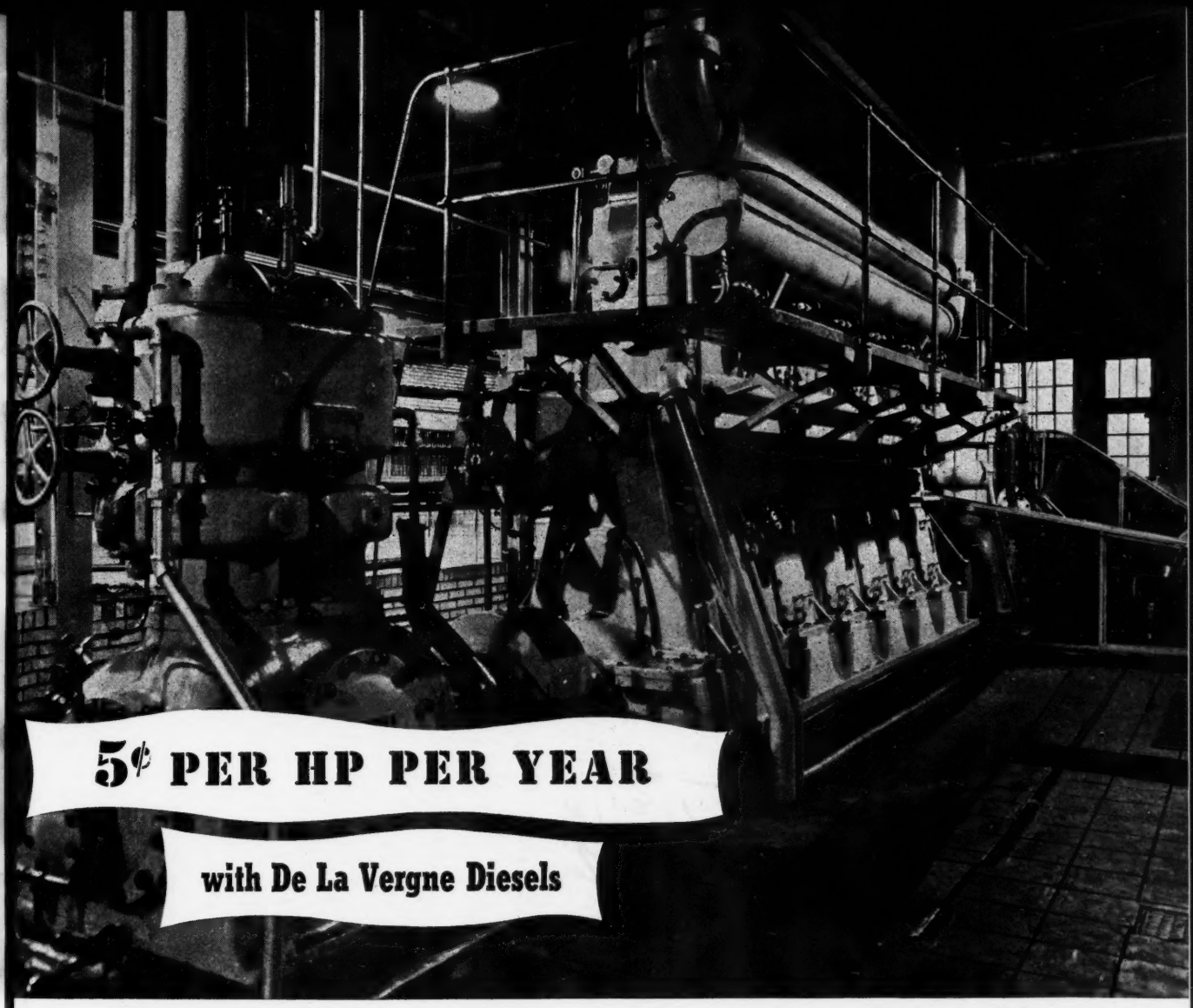
13 **Metallizing Equipment**—16-p. Bulletin 42A recently published describes the metallizing process and equipment for its application. Also tells how essential industries are eliminating replacements, and increasing service-life of equipment. Metallizing Engineering Co., Inc.

14 **Quick Patch Cement**—Information on a new product for patching holes in concrete floors is outlined in a new handbook which contains complete instructions for doing the job. Smooth-On Manufacturing Co.

15 **Cleaning Compounds**—The Cleaning of Industrial Floors, gives the important reasons for keeping plant floors clean and information on how every type of floor should be cleaned. It has information on what cleaners are best and lists the dangers of haphazard cleaning methods. Magnus Chemical Co.

Boilers, Auxiliary Equipment and Valves

16 **Boilers**—A new bulletin No. 27 describing H-type steam generators shows details of construction of this line built for stoker, oil, or pulverized coal firing in sizes ranging from 20,000 to 150,000 lb. per hr. Union Iron Works.



5¢ PER HP PER YEAR

with De La Vergne Diesels

For low maintenance costs, it's hard to beat the 5c-per-hp-per-year record of the two 320-hp De La Vergne diesels in the Huntington and Smithtown plants of the Long Island Ice Corporation. For a 10-year period, the entire cost for maintenance was $337.33—$164.01 at Huntington, $173.32 at Smithtown. Original pistons, cylinder liners, bearings, and inlet and exhaust valves are still in service.

Every item of operating cost has been low and not once in 75,000 hours of service in each plant have the diesels failed to deliver the required power.

The success of one plant might be a happy accident, but almost identical results at Huntington and Smithtown plants are evidence that the equipment and the operating system are right.

Careful planning, sound plant operation, and the best in diesels have produced two outstanding cases of diesel engine economy and durability.

Regardless of your power requirements, there is a De La Vergne Diesel to suit your needs. Ranging in size from 200 bhp to 1500 bhp, these sturdy, precision-built engines are providing low-cost power in hundreds of plants from coast to coast. A De La Vergne engineer will be glad to assist you with your power problems.

BALDWIN

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SALES CORP.

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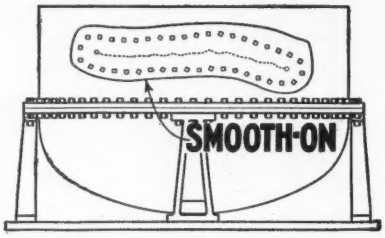
SUBSIDIARY OF THE BALDWIN LOCOMOTIVE WORKS • PHILADELPHIA

BUILDERS OF DEPENDABLE ENGINES SINCE 1880

Protect your plant from lengthy service interruptions



SMOOTH-ON Repairs SAVE TIME

Even a slight leak in a seam or joint, or a small crack in a casing or machine part, may later cause serious trouble and lengthy interruption to service if not corrected. Such repairs need not require dismantling of equipment and considerable loss of production time. Instead, they can be speedily made with SMOOTH-ON No. 1. This many-purpose iron repair cement has so thoroughly demonstrated its helpfulness for more than 45 years that thousands of plant engineers always keep a can on hand.

Today, when lengthy service interruptions cannot be tolerated, and replacements of parts are hard to get, SMOOTH-ON is more necessary than ever before. Get a can without delay, so you will be prepared for quick repairs of leaks, cracks and loose parts on plant equipment and structures.

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Buy Smooth-On in 7-oz., 1-lb., 5-lb. cans and larger kegs. For your protection, insist on Smooth-On, used by engineers since 1895. Obtainable from your dealer, or if necessary, from us.

This useful manual, illustrated with 170 diagrams, gives concise, simple suggestions that will save you time, labor and expense on repair and maintenance jobs all around the plant. A real necessity for every engineer, and will be sent you FREE if you fill in and return the coupon.

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17 Oil Burners—Bulletin 108, 4-p. describes Type A and H oil burners, atomizers and registers. Peabody Engineering Corp.

18 Boiler Level Controls—A new bulletin illustrates and describes two improved types of boiler level controllers, pilot operated and rotary. Both are designed on the cantilever principle which permits wide range of movement for valve motivation and the use of a smaller valve. J. A. Campbell Co.

19 Welding Fittings—Red Man welding necks, nozzles, elliptical handholes and manholes—products that are used by equipment fabricators to the petroleum, ship building, power and chemical industries—are described in a 32 p. Catalog 842 prepared as a reference manual. Lenape Hydraulic Pressing & Forging Co.

20 Valves—A 32 p. Bulletin E-100 just published describes quick-operating valves for blow-off, water columns and other boiler room services. The bulletin is illustrated with large, self-explanatory views which clearly show the design and construction of the various valves. The text is arranged for quick reference, and explains in detail the exclusive features of the designs. Complete tables of specifications, dimensions and prices are also included. Everlasting Valve Co.

Miscellaneous

21 Victory V-Belt Sheaves—Dodge wood sheaves are a direct and important contribution to the war effort through (1) a direct saving of essential metals, (2) quick delivery because no strategic materials are included. The new wood sheave is more an alternate than a substitute because it transmits power as efficiently as a metal sheave and has the additional feature of lightness, firmer fastening to shaft and ability to absorb shock. Built in three types with sizes ranging from 3 to 44 in., pitch diameter for $\frac{3}{12}$ by $\frac{11}{12}$ in., $\frac{7}{16}$ by $\frac{7}{16}$ in. and $\frac{7}{18}$ by $\frac{7}{8}$ in. belts. Dodge Manufacturing Corp.

22 Diesel Electric Locomotives—For large industrial plants, mines, and main line hauling, Diesel electric locomotives of from 10 to 80 t. are described in a new 100-p. booklet, B-300. Characteristics of Diesel-electric units are compared to steam and mechanical locomotives from the standpoint of availability, reliability, safety and pulling power. Performance operation, motor and control data are given for 76 typical installations. Westinghouse Elec. & Mfg. Co.

23 Special Tools—A 4-p. folder describes eight Ideal specialties including: machine tool center, electric etcher, marking tools; wheel dresser, demagnetizer, and hand vacuum cleaners. Ideal Commutator Dresser Co.

24 Coupling Selector—L-R Selector Charts for determining flexible shaft coupling are available with the complete L-R catalog on couplings made in every size and for every duty from 1/6-h.p. for pumps and small equipment to 16¾ in. bore for heavy duty in steel mills. Lovejoy Flexible Coupling Co.

25 Elevator Conveyors—A new 32-p. catalog 2075 and data book on elevator conveyors with sizes, power formulae and engineering information. Materials that can be handled are listed and case studies are given. Link-Belt Co.

26 Truck Crane—A new 6-p. illustrated Bulletin No. 1928 describes the Model HC-70 truck-mounted crane. Brief specifications, clearance dimensions and lifting capacities with 30, 40 or 50 ft. long boom, with or without the use of outriggers are given. Link-Belt Speeder Corp.

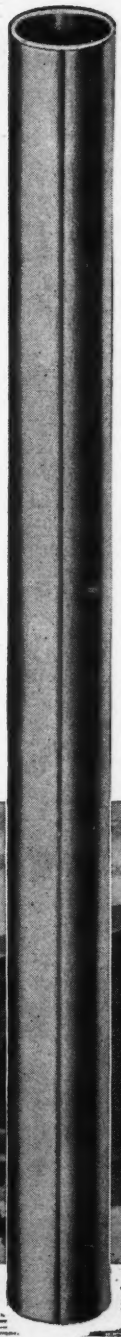
27 Office Erection—Speedy Erection of Offices in industrial plants is the subject of a new illustrated folder TR-29A. Directed to plant operators faced with the problem of providing additional offices quickly, the folder points out the versatility of movable asbestos walls, which, it states, can make possible, in many cases, the complete construction of completely finished new offices overnight. Johns-Manville.

G-L-O-B-E SPELLS SAFETY AND SAVINGS IN PRESSURE TUBES

Service records in many of the nation's noteworthy power plants — their use by leading railroads, industrial and marine boiler builders — attest the greater value, safety and savings of Globe Steel Tubes.

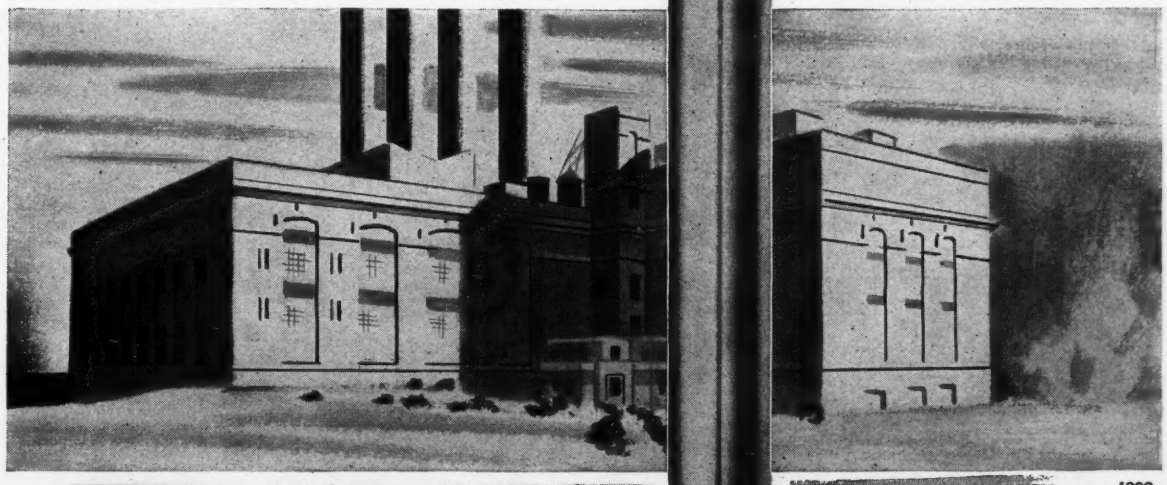
Their extra margin of safety and strength — particularly vital to meet modern high pressure and temperature demands — more than offsets any immediate advantage of lower first cost.

GLOBE STEEL TUBES CO.



Globe engineers are always available to assist in selecting a tube with the exact characteristics you require.

MILWAUKEE, WIS.



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GLOBE TUBES

GLOBE STEEL TUBES

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- Condenser and Heat Exchanger Tubes
- Boiler Tubes
- Mechanical Tubing

DAVIS INDUSTRIAL TYPE Solenoid Valves

1. QUALITY CONSTRUCTION. **Every Davis Solenoid Valve is specifically designed and built to stand up under heavy duty industrial service.**

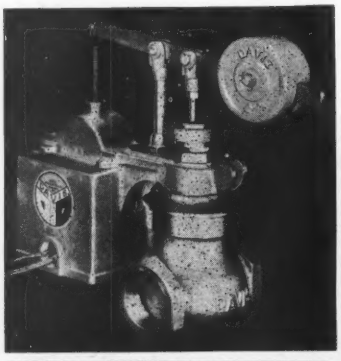
2. COMPLETE LINE. **14 different standard types and dozens of special designs. Sizes ranging from ½" to 12". For pressures to 1,500 lbs. per sq. in. or higher.**

3. EXCLUSIVE FEATURES. **Davis' special design features include: semi-selfcleaning valves for handling heavy viscous materials, patented throttling action for container filling service, leakproof valve heads for volatile materials, etc.**

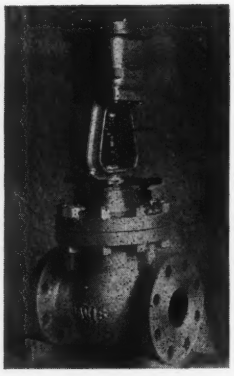
We will be glad to make recommendations on your particular requirements. Ask for a copy of the Davis Solenoid Valve Catalog.

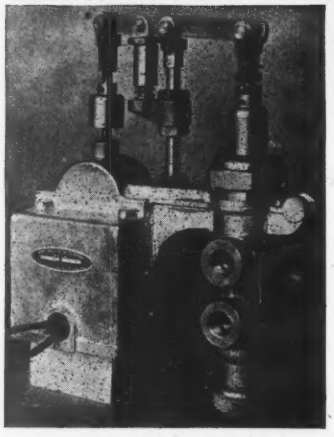
DAVIS REGULATOR CO.

2508 S. Washtenaw Ave. Chicago, Illinois



Left: No. 93 is a simple, general purpose valve.





Above: No. 93 H unit with solenoid operated pilot valve and hydraulically actuated main valve built for use on a 400 lb. pressure water main.

Left: No. 380 is a 3 or 4-way pilot valve widely used on air or liquid actuated power cylinders.

DAVIS AUTOMATIC VALVE SPECIALTIES

28 **Centralized Lubricating System**—4-p. folder complete with engineering diagram describes single pipe centralized system that lubricates all the connected bearings without employing any springs, diaphragms, packing or exposed moving parts. Trabon Engineering Corp.

29 **Wartime Safety Equipment** — Essential emergency equipment for safety and plant protection is described in a new 8-p. bulletin G-5 illustrating the complete range of safety equipment needed during wartime. A description is given for gas masks, helmets, inhalators, gas detectors, asbestos suits, respirators, and many more items. Mine Safety Appliance Co.

30 **Sawing Machine Guide**—A 48-p. well illustrated booklet for machine operators engaged in production jobs where speed and accuracy are important has been recently released. The material is in "chalk talk" with an illustration for each operation and time saving method that can be done with a Doall machine. Continental Machines, Inc.

31 **Wire Nuts**—Saving of vital materials in wiring jobs and eliminating the use of lead, tin, solder and rubber by the adaptation of wire-nuts is described in a new 4-p. bulletin. Ideal Commutator Dresser Co.

32 **Wire**—Chart with data on wire used in designs or specifications has a columnar tabulation on B & S, Washburn & Moen and the Stubs or Birmingham diameters for gage sizes 1 to 50.

The reverse side of the chart gives nominal analysis composition, approximate percentage of elongation for hard or soft grades, tensile strengths in lbs. psi., and density in lb. per cubic in. Wire Division, Callite Tungsten Corp.

33 **Rubber Hose**—Wall cards on the care of rubber hose are available for hanging in the plant or factory. One card covers the care of fire hose, and the other lists the rules for prolonging life in air, water, steam, and other types and for proper attaching of couplings. Manhattan Rubber Mfg. Division of Raybestos-Manhattan, Inc.

34 **Synthetic Rubber Sponge**—A 4-p. catalog section 8012 on synthetic sponge rubber describes the properties and gives the dimensions for stock sizes of available slabs, tubing, cord and molded shapes. B. F. Goodrich Co.

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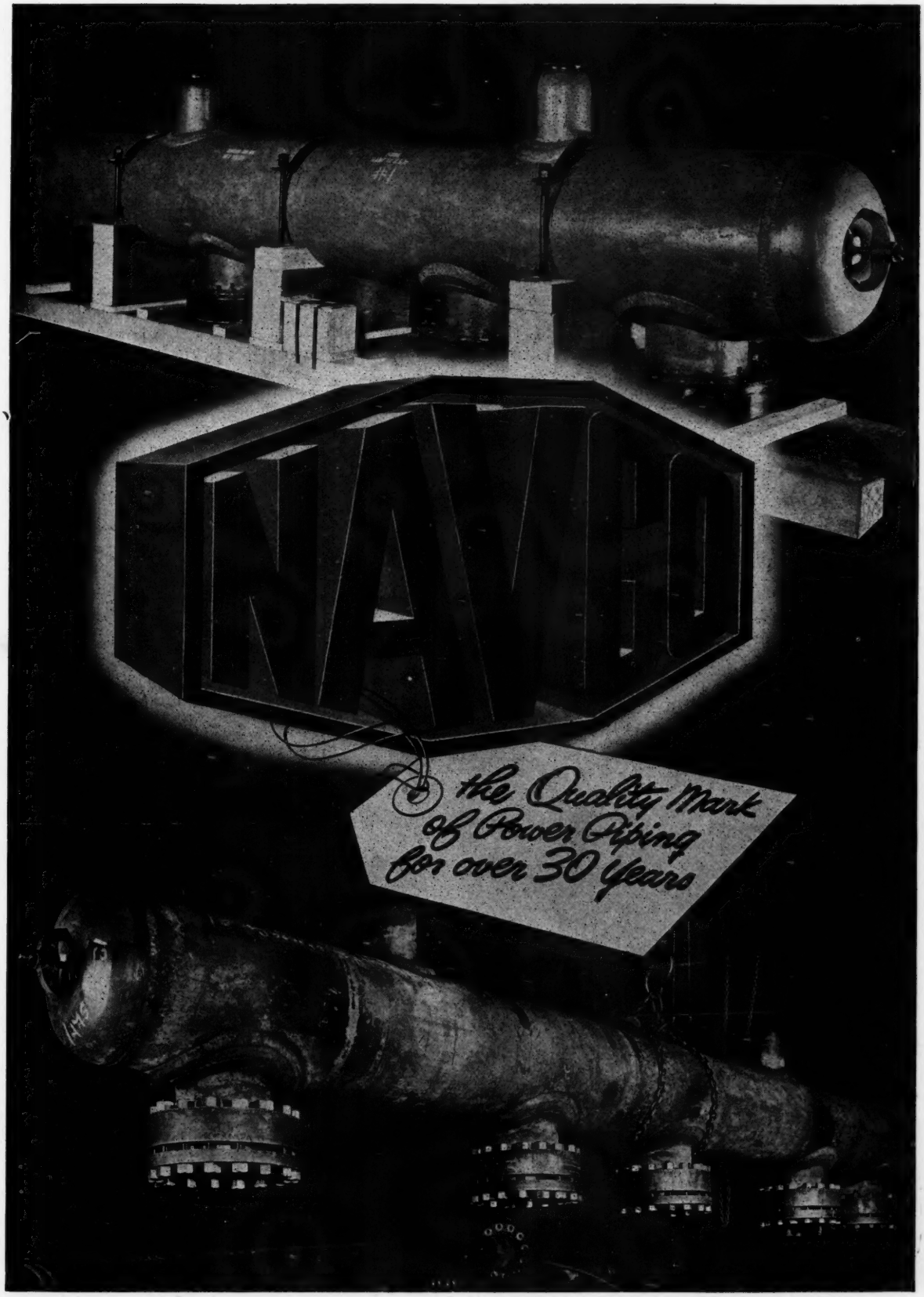
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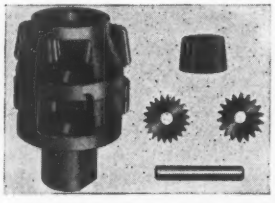
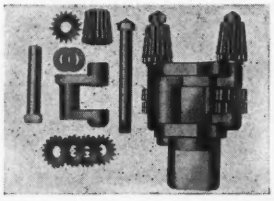
the Quality Mark
of Power Piping
for over 30 Years

STEP UP BOILER EFFICIENCY

Today, with boilers operating beyond normal rating, scale forms all the more rapidly. To protect valuable tubes and keep boilers efficient, that scale must be removed with the proper tools. Airetool Tube Cleaners will do that job perfectly. The unusually powerful motor enables you to use many cutter head combinations. They are equipped with non-tracking cutters to eliminate tube damage. Wearing parts are made of tough alloys precision machined and properly heat treated. Motors are slip-fit for easy replacement of parts. Sizes for straight or bent tubes ½" to 20" I.D. Air, steam or water driven motors.





CUTTER HEADS

Cutter heads especially designed for every scale condition are made by Airetool. Several are shown above to illustrate the replaceable parts. In addition to the many cutter heads, there are Brush Heads, Drill Heads and Knocker or Vibrator Heads. (The latter are used for removing scale from the outsides of tubes.)

WRITE FOR COMPLETE DETAILS IN OUR BULLETIN PE-14

AIRETOOL
MANUFACTURING CO.
SPRINGFIELD, OHIO
Representatives in Principal Cities
New York Address, 50 Church St.

Power Plant Construction News

Colo., Denver—War Department, 20th St. and Constitution Ave., N. W., Washington, D. C., plans steam power plant at new air force training school in vicinity of Buckley Field, near Denver. Also will install complete electric light and power utilities. Entire project will cost over $5,000,000, and will be carried out under direction of United States Engineer Office, Denver.

Ill., Chicago—Republic Steel Corp., Republic Building, Cleveland, Ohio, has awarded contract to United Engineers & Constructors, Inc., 1401 Arch St., Philadelphia, Pa., consulting engineer, for design and construction of new power plant at South Chicago Works, near 118th St. and Burley Ave. Cost reported over $850,000 with equipment. Proposed to begin work soon.

Ill., Jacksonville—Light and Power Department is considering plans for expansion and improvements in municipal power plant, including installation of additional equipment for increased capacity. Cost reported over $175,000, with equipment.

Ill., Jacksonville—National Enameling & Stamping Co., 270 N. 12th St., Milwaukee, Wis., manufacturer of enameled iron products, plans installation of power equipment in new plant at Jacksonville, for production for Government, comprising several one-story units. Entire project will cost about $1,250,000. Work will begin at early date.

Ind., Terre Haute—Public Service Co. of Indiana, Indianapolis, Ind., has plans maturing for addition to Dresser steam-electric generating station at Terre Haute, with installation of additional equipment for increased capacity. A new steel stack will be built. No estimate of cost announced. Sargent & Lundy, Inc., 140 S. Dearborn St., Chicago, Ill., is consulting engineer.

Ky., Louisville—Tube Turns, Inc., 224 East Broadway, manufacturer of seamless drawn fittings for welding service, plans installation of electric power equipment in new 1-story plant addition, about 190 by 220 ft. Entire project is reported to cost over $100,000. Work will begin soon.

Md., Baltimore—Bethlehem Steel Co., Shipbuilding Division, 1101 Key Highway, has plans under way for new power house at local shipyard. No estimate of cost announced. Proposed to ask bids soon.

Mich., Detroit—Warner Aircraft Corp., 20263 Hoover Ave., manufacturer of airplanes and parts, plans installation of electric power equipment in new 1-story addition, 30 by 325 ft. Entire project will cost over $100,000. H. D. Ilgenfritz, 468 Prentis St., Detroit, is architect.

Mich., Saginaw—Chevrolet Motor Division, General Motors Corp., 3044 W. Grand Blvd., Detroit, Mich., plans installation of electric power equipment in new 1-story addition to branch plant at Saginaw, for expansion in production of aluminum forgings. Entire project will cost in excess of $500,000. Proposed to begin work soon.

Minn., Duluth—Minnesota Power & Light Co., 30 W. Superior St., has completed plans for new high-tension power substation at foot of 50th Ave., West, and will begin work soon. This is part of a general expansion project to be carried out, including addition to steam-electric generating station to increase capacity from 25,000 kw. to 50,000 kw., extensions in switchyard, transmission lines, etc. Entire project will cost approximately $2,700,000.

Mont., Thompson Falls—Montana Power Co., Butte, Mont., plans new hydroelectric generating station on Clark Fork River, vicinity of Thompson Falls (Sanders County), comprising power dam, hydroelectric power plant equipped for initial rating of 50,000 hp., switching station, transmission lines for connection with present high-tension system, and other facilities. Application has been made to Federal Power Commission, Washington, D. C., for permission to construct plant.

Neb., Sidney—Consumers Public Power District, Columbus, Neb., has approved plans for extensions in power plant in vicinity of Sidney, with installation of new Diesel engine-generator unit and auxiliary equipment. Also will build additions to transmission lines in that district for power service for new ordnance plant of Government. Entire project will cost close to $100,000, and will be carried out at early date.

Ohio, Cleveland—White Motor Co., 842 E. 79th St., is completing plans for new steam power house at motor truck works, estimated to cost over $85,000, with equipment. H. Ralph Hadlow, 700 Prospect St., Cleveland, is consulting engineer.

Ohio, Columbus—Timken Roller Bearing Co., 1025 Cleveland Ave., manufacturer of steel bearings, etc., plans addition to boiler house at local plant, including installation of new 300-hp. boiler unit stoker and auxiliary equipment. This is part of expansion program to be carried out at plant, entire project to cost over $600,000. Main offices are at Canton, O.

Okla., Ponca City—Continental Oil Co., Ponca City, plans steam power plants in connection with two new oil refining plants in vicinity of city for production of high-octane gasoline and toluene, an ingredient of explosives, respectively, for production for Government. Also will install pumping units, steel pressure tanks and other equipment. Entire project reported to cost over $3,000,000. Financing will be provided by Defense Plant Corp., Washington, D. C., a Federal Agency.

Pa., Erie—Hammermill Paper Co., East Lake Road, has plans maturing for addition to steam power plant for service at mill, about 40 by 50 ft. Cost reported close to $75,000, with boiler units and auxiliary equipment. Otto C. Schoenwerk, 3240 N. Lake Shore Dr., Chicago, Ill., is consulting engineer.

R. I., Providence—Wanskuck Co., 1117 Douglas Ave., manufacturer of textile products, has filed plans for addition to boiler plant at mill. Additional equipment will be installed for increased capacity. Cost reported close to $30,000. Work is scheduled to begin at once.

Tenn., Memphis—Caine Steel Co., 1820 N. Central Ave., Chicago, Ill., plans installation of electric power equipment in proposed new steel fabricating plant on tract of about 15 acres of land at Weakley and N. 7th Sts., Memphis, recently acquired. A power substation will be built. Entire project is reported to cost in excess of $150,000.

Texas, Houston—Texas Electric Steel Casting Co., Inc., Bringhurst and Gillespie Sts., manufacturer of steel castings, plans installation of electric power equipment in new additions to mill. Additional electric furnace units and accessories will be installed. Entire project will cost over $700,000.

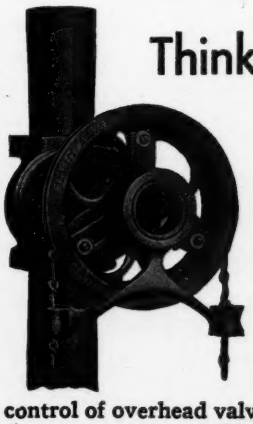
Wash., Seattle—Bethlehem Steel Co., Seattle, plans installation of electric power equipment in new additions to plant on 28th Ave., S. W., Youngstown, near Seattle, comprising four 1-story buildings. Entire project will cost over $600,000. Proposed to carry out work soon.

Wash., Seattle—Burke Millwork Co., 3205 Fremont Ave., plans new boiler house, about 34 by 39 ft., for service at plant. Cost reported close to $30,000, with boiler units and auxiliary equipment. Loveless, Fey & Lamont, 711 Broadway North, are architects.

Wis., Kenosha—Nash-Kelvinator Corp., Kenosha, plans installation of electric power equipment in new 1-story addition, 320 by 640 ft., to local motor works, for expansion in motor-assembling division for production for Government. Cost close to $1,000,000. Work will begin soon. Albert Kahn Associated Architects & Engineers, Inc., New Center Building, Detroit, Mich., is architect and engineer.

Wis., Union Center—Wisconsin Cooperative Creamery Association, Union Center, Garry Carter, president, plans installation of electric power equipment in new 1 and 2-story milk dehydrating plant, about 70 by 210 ft., on local site. A boiler house is under consideration. Entire project is estimated to cost about $115,000. Klinger & Hubbard, Culver Building, Eau Claire, Wis., are architects.

Wyo., Casper—War Department, 20th St. and Constitution Ave., N. W., Washington, D. C., plans steam power house and pumping station at new air base training school in Wyoming (exact location withheld). Also will install electric utilities for light and power service. Entire project will cost over $5,000,000. Toltz, King & Day, Inc., Pioneer Building, St. Paul, Minn., is engineer. Project will be carried out under direction of United States Engineer Office, Omaha, Neb.



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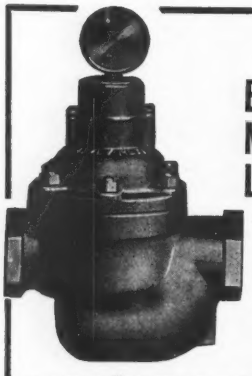

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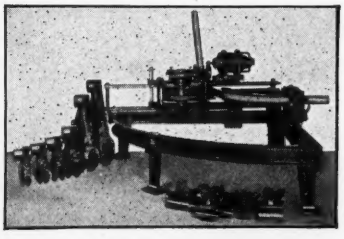

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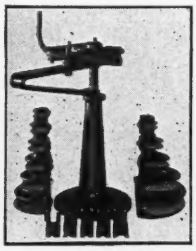

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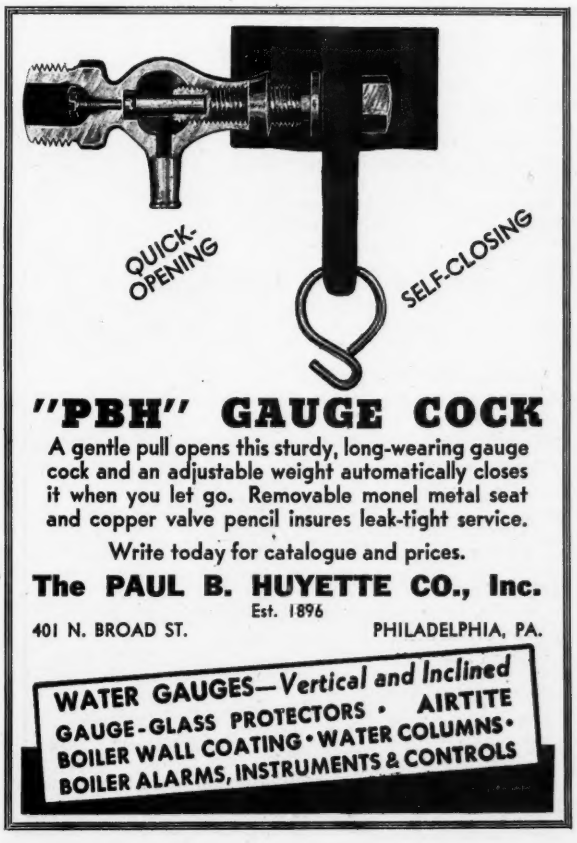

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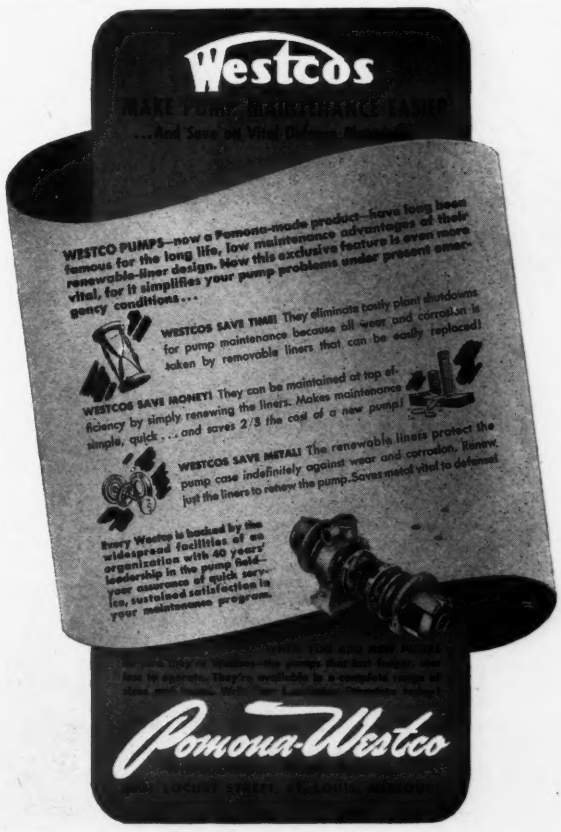
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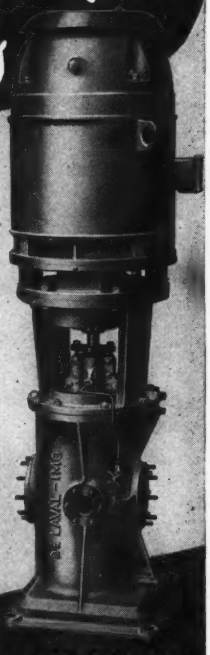

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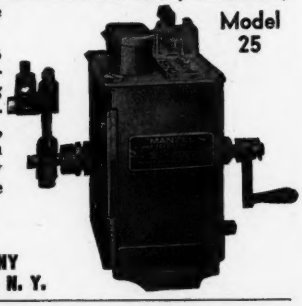

Manzels are sturdily built, convenient to operate, and deliver oil to cylinder or bearing with unfailing regularity, automatically. They start, stop, speed up and slow down with the machine. Feed is easily set and capable of very fine adjustment.

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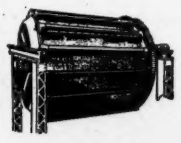

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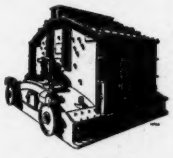

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The Central Feed **REVERSIBLE** is the most outstanding advance in Hammermill design in 20 years . . . **REVERSIBILITY** is an exclusive "Pennsylvania" feature. Automatic hammer turning. Feed R.O.M. or smaller . . . Adjustable Cages . . . Tramp Iron protection. Rugged . . . dependable. 25 to 500 T.P.H. Steelbuilt. Patented. Bulletin No. 1030.

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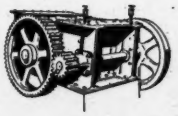

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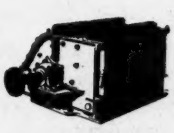

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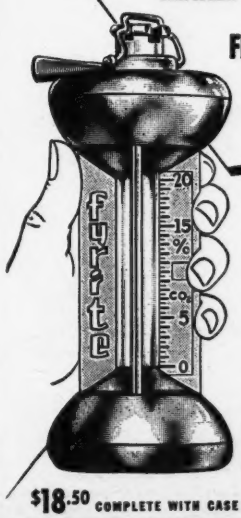

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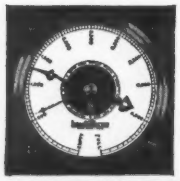

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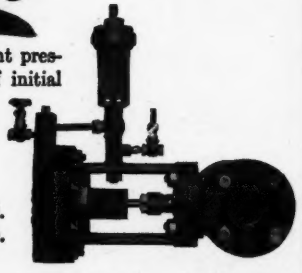

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Crane Co.
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Everlasting Valve Co.
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Grinnell Company, Inc.
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National Valve & Mfg. Co.
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Williams Valve Co., The D. T.

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Fairbanks Company, The
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Fisher Governor Co.
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Make it a rule to turn first to this up-to-date directory when you're in the market for power service equipment and supplies. It's classified for your convenience, can save you time and money.

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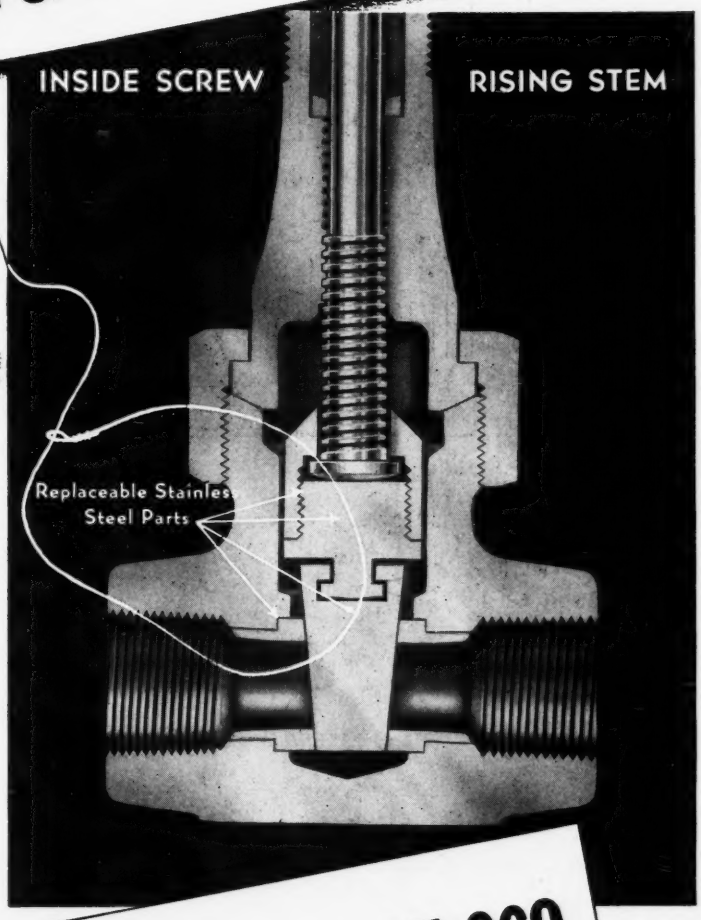

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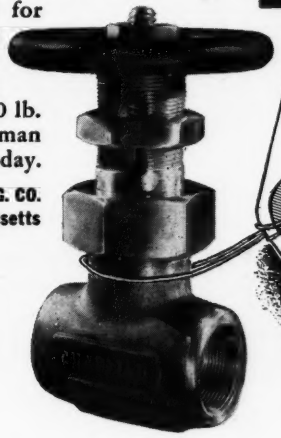

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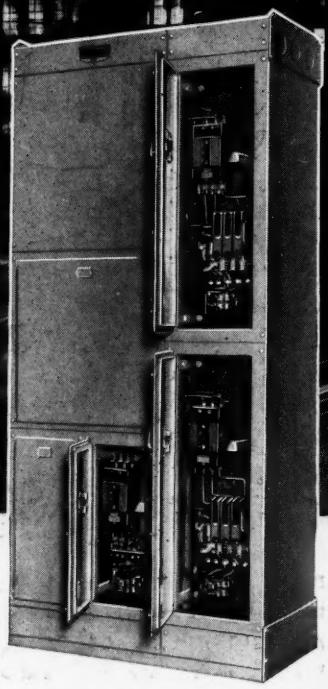

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